MOBILIZING FINANCES FOR RENEWABLE ENERGY PROJECTS IN SAARC

SAARC ENERGY CENTER

September 2020

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Foreword

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Renewable Energies (REs) are rapidly developing around the globe. With the increasing energy needs, depletion of fossil fuels and increase in prices of conventional energy supplies, thrust has been developed to harness available renewable energy resources to meet the global energy requirements. Initiatives to enhance power generation capacities to serve the future energy needs are planned by the countries on priority basis.

SAARC Member States are quite ambitious to develop and promote renewable energy resources for electricity generation. However, the growth in most of the countries has remained slow due to various hindering factors. One of the critical factors is the poor flow of direct foreign investment towards developing low carbon technologies in this region. It has been noted that quite a few available technologies are not yet profitable in commercial terms, and support mechanisms are required for private investment to take place.

The SAARC Expert Group on Renewable Energy during its first meeting in the year 2011 noted that the SAARC countries, in many cases, are finding it difficult to implement their planned activities due to shortage of financing capabilities. Therefore, the SAARC Expert Group on Renewable Energy consented to conduct a study to suggest way forward for mobilizing international and regional finances / funding in for implementation of renewable energy projects. SAARC Energy Centre under the directive of the Expert Group on renewable energy undertook this study in year 2018. The study is envisioned to explore ways to seek international and regional financial support for execution of Renewable Energy projects in the region. This report also proposes an efficient mechanism to mobilize climate financing for the involvement of private sector in renewable energy projects. SEC looks forward to your comments and feedback on this report.

Acknowledgement

Mr. Ihsanullah Marwat, Research Fellow (Energy Efficiency) under the overall guidance of Mr. Mohammad Naeem Malik, Director SEC., managed the development of this study report. The study report has been authored and developed with the expert assistance of Pricewaterhouse Coopers (Pvt.) Ltd., India. SEC would especially like to acknowledge Mr. Amit Kumar, Mr. Sandeep Kumar Mohanty, Mr. Jitaditya Dey, Ms. Purvi Mehta and Mr. Ravichandran Pradeep Kumar for their contributions as authors of the report. Finally, SEC would also like to acknowledge Mr. Amer Zafar Durrani for carrying out Peer Review of the study report.

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List of Abbreviations

Abbreviation	Full Form
ABS	Asset backed securities
ADB	Asian Development Bank
AEDB	Alternate Energy Development Board
AEPC	Alternative Energy Promotion Centre
AfDB	African Development Bank
ASERD	Afghanistan Sustainable Energy for Rural Development
ASPIRE	Accelerating Sustainable Private Investments in Renewable Energy
BoI	Board of Investment
BOT	Build - Own- Operate
BPDB	Bangladesh Power Development Board
BREB	Bangladesh Rural Electrification Board
CAGR	Compound Annual Growth Rate
CBEC	Board of Excise and Customs
CDM	Clean Development Mechanisms
CEB	Ceylon Electricity Board
CER	Certified Emission Reductions
CIF	Climate Investment Funds
CPEC	China Pakistan Economic Corridor
CSP	Concentrating Solar Power
DFI	Development Finance Institutions
DGM	Department of Geology Mines
DHPS	Department of Hydropower and Power systems
DRE	Department of Renewable Energy, Bhutan
EBRD	European Bank for Reconstruction and Development
ECA	Export Credit Agencies
EE	Energy Efficiency
EFSI	European Fund for Strategic Investments

Abbreviation	Full Form
EIB	European Investment Bank
ENCON	Energy Conservation Promotion Fund.
EPC	Engineering Procurement and Construction
EUR	Euro
EXIM	Export–Import Bank of India
GBI	Generation Based Incentives
GBP	British Pound
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHS	Greenhouse gases
GIB	Green Investment Bank
GJ	Gigajoule
GoB	Government of Bangladesh
GST	Goods and service tax
GW	Giga Watt
GWh	Giga Watt per hour
IDA	International Development Association
IDCOL	Infrastructure Development Company Limited
IDEA	Institutional Development for Energy in Afghanistan
IDFC	Infrastructure Development Finance Company
IFC	International Finance Corporation
IFI	International Financial Institutions
INDC	Intended Nationally Determined Contributions
InVITs	Infrastructure Investment Trusts
IREDA	Indian Renewable Energy Development Agency limited
IRENA	International Renewable Energy Agency
JICA	Japanese International Cooperation Agency

Abbreviation	Full Form
kW	Kilo watt
kWh	Kilo watt hour
LCOE	Levelised Cost of Electricity
LECO	Lanka Electricity Company (Private) Limited
MDB	Multilateral development banks
MEE	Ministry of Environment and Energy
MHP	Micro Hydro Power
MIGA	Multilateral Investment Guarantee Agency
MNRE	Ministry of New and Renewable Energy
MoU	Memorandum of understanding
MPEMR	Ministry of Power, Energy and Mineral Resources
MRRD	Rural Rehabilitation and Development
MW	Mega Watt
NACC	Nepal Alliance for Clean Cook stoves
NAMAs	Nationally Appropriate Mitigation Activities
NCEF	National Clean Energy Fund
NDB	New Development Bank
NDC	Nationally Determined Contribution
NEA	Nepal Electricity Authority
NEPRA	National Electric Power Regulatory Authority
NGO	Non-Government Organisation
NISE	National Institute of Solar Energy
NMMs	New Market Mechanisms
NREL	National Renewable Energy Laboratory
NTPC	National Thermal Power Corporation limited
O&M	Operation & Maintenance
OECD	Organisation for Economic Co-operation and Development
pa	per annum

Abbreviation	Full Form
PCI	Participating credit institutions
PFA	Project Finance Agreement
PIU	Project Implementation Unit
POs	Participating Organizations
POSIED	Preparing Outer Islands for Sustainable Energy Development
PPA	Power Purchase Agreement
PPP	Public Private Partnership
PSMP	Power system master plan
PV	photovoltaics
PwC	Pricewaterhouse Coopers
RE	Renewable Energy
REEEP	Renewable energy and energy efficiency Programme
RESCO	Renewable Energy Service Company
RET	Renewable Energy Technology
RGoB	Royal Government of Bhutan
RPO	Renewable purchase obligations
RPSSGP	Rooftop PV and Small Solar Power Generation Programme
SAARC	South Asian Association for Regional Coorporation
SAEF	South Asia Economic Focus
SASEC	South Asia Sub-regional Economic Cooperation
SBC	Sadharan Bima Corporation
SCCI	Swedish Chamber of Commerce
SDF	SAARC Development Fund
SEC	SAARC Energy Centre
SEF	Sustainable Energy Finance
SHS	Solar Home System
SIDBI	Small Industries Development Bank of India
SLCCS	Sri Lanka Carbon Crediting Scheme

Abbreviation	Full Form
SLSEA	Sri Lanka Sustainable Energy Authority
SPV	Special Purpose Vehicle
SREDA	Sustainable and Renewable Energy Development Authority
SREF	Small-scale Renewables Financing Facility
SREP	Small Scale Energy Project
SSEP	Sindh Solar Energy Program
STELCO	State Electric Company
T&D	Transmission and Distribution
TEDAP	Tanzania Energy Development and Access Project
TWh	Tera-Watt Hour
UK	United Kingdom
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
USD	United States Dollar
VC	Venture Capital
VGF	Viability Gap Funding
WACC	Weighted Average Cost of Capital

Executive Summary

Access to clean and affordable energy has a major role to play in the process of economic development in SAARC Member States. Not only will it help to grow economically, enhance job creation, and boost business activities but shall also contribute towards poverty eradication, food security, and environmental protection. In fact, experience has proven that access to modern energy is a requisite for achieving the Millennium Development Goals (UNDP 2013). The SAARC nations comprises about 21% of the world's population but their share in the global economy is 3.8%. One of the major reasons for low share in the global economy is lack of sustainable electricity. Millions of people in SAARC nations still have no access to electricity. By 2020, the demand for energy in SAARC nations is expected to be ~21 million GWh growing at a CAGR of 7.4%. In order to meet the vast energy demand, use of renewable energy technology will play a major role in the SAARC Member States. Sustainable sources of energy will provide electricity to majority of people who reside in the remote locations.

Due to high demand for electricity amongst the SAARC Member States, the need to procure electricity from renewable energy sources becomes inevitable. Increase in oil prices have put further strain on resources of all SAARC nations. Some of the countries have experience in using environment-friendly renewable energy sources including micro financing for rural energy in Bangladesh, wind, solar and biogas plants in India, micro-hydro plants in Nepal, small hydro and solar plants in Pakistan and grid connected small hydro plants in Sri Lanka. The region has been developing policies and programmes, whereas efforts are being made to implement them effectively and efficiently. Despite great opportunities in the renewable energy sector, the SAARC region has not fully stepped into this sector because of various barriers.

In all SAARC countries being emerging economics, the emphasis has traditionally been on encouraging the lowest cost of energy generation. However, over the past couple of years, considering the technological advances and increased scale of renewable energy installations worldwide, renewable energy has now become very competitive. Renewable energy also has several qualitative benefits, which include environment friendly power generation and reduction in overall carbon footprint. On comparing the levelized cost of electricity of renewables with thermal, we realize that renewable energy has reached cost parity with thermal energy in several countries. Hence, the support for market development of renewable energy is now more than ever.

Finance is essential for renewable energy technology projects in two ways. Firstly, without proper financing, renewable energy projects will not materialize. Secondly, with inadequate financial structure and conditions the costs of electricity produced from renewable energy technologies will increase substantially. Project developers generally can obtain capital for the up-front cost of building a renewable energy project through debt and equity financing. There are many ways to structure loan agreements, and debt, which can be obtained through public markets like bonds or private placements like institutional debt and bank loans. By addressing various risks, guarantee instruments can improve the structure and quality of renewable energy investment, making projects more attractive to private investors. Guarantees supporting energy investments are usually issued by public entities such as governments and international finance institutions to address political, policy, credit risk, currency risk and technological risk. Enabling policies, financial structures and risk mitigation instruments are not enough alone to achieve the necessary scale of investment. Hence, access to capital markets tools like green bonds, InvITs, etc. are becoming increasingly important in this context, as it provides necessary liquidity and long-term finance needed in the sector.

Countries in the region have put considerable effort into setting renewable energy targets and are introducing supportive policy frameworks to attract private sector investment. An effective system of financial and non-financial incentives must also be in place to ensure appropriate conditions to leverage renewable energy's potential. SAARC nations provide financial incentives like tax exemptions, no import duty on related equipment, R&D incentives, grant of capital cost, etc. and Non-Financial incentives like standard power purchase agreement (PPA), arrangement for small generator and information support. There are several financial undertakings and programmes that have been developed by SAARC Member States to attract investments. While there are certain barriers that hinder investments, probable methods to mitigate the risks are been developed in some countries.

Mobilizing international and regional funding for renewable energy projects will happen with governments commitment by developing right policy framework required to encourage private players to invest in the sector. Along with a robust policy and hassle-free investment climate, which forms the basis; targeted government interventions and initial funding by public finance institutions will be needed to set the ball rolling for further funding. A combination of various risk mitigating financial instruments and other creative financial solutions such as hybrid debt structures, loan syndication on lending and structured finance mechanisms need to be leveraged to pick up the pace of investment. Complementing the above solutions with international initiatives such as clean development mechanisms and cross border collaborations can provide the international support that renewable energy

projects need. All this needs a dedicated body at the SAARC level to overlook the smooth execution of a balanced mix of the above solutions by the SAARC members.

Based on a detailed review of the energy and sustainable development landscape in the SAARC region, the report identifies key focus areas that will play a major role in development of the sector.

Promotion of renewable energy use

Deficient in fossil fuels, SAARC Member States can especially benefit from the development of renewable energy resources like solar, wind, biomass and hydropower. Efficient, low-cost technology and regulation play a critical role in upscaling of renewable energy. Due to lack of government funds, efficient means of upscaling renewable energy has been a major concern for the SAARC Member States. Despite targets set by each SAARC nation, there is not much awareness among the policy makers. Due to high capital cost and lack of information on benefits of renewable energy, millions of people are still reluctant to set up renewable energy plants. The SAARC Member States can collaborate, as it will be beneficial in developing technology research and development, knowledge sharing, deployment of funds and conceptualizing new regulatory frameworks.

Emphasis on low cost financing in Renewable Energy

A significant amount of capital investment is required at the start of renewable energy projects. The initial capital cost of wind, photovoltaic, and hydropower often comprise nearly 90% of total project costs. In contrast, the initial investment of gas projects represents only one-third of the total lifetime costs, which includes the operating costs. In the case of coal and gas, the exact proportions depend largely on fuel expenses, which can drive operating costs. According to a report by the climate policy initiative, initial capital costs and financing are about 60% more important for renewable energy. Most renewable energy projects use debt – either directly at the project level or on the balance sheet of the corporate owner – to reduce the cost of financing. Therefore, the availability of low-cost debt is a critical driver of renewable energy costs.

Significant role of investment by private sector in Renewable Energy

Since public funding in renewable energy sector is limited, private investors will supply a large share of new investments that are required to implement renewable energy projects. Multilateral agencies have played a crucial role by funding a part of the initial project cost. These funds have been used by the SAARC member states to implement small to large-scale projects. Institutional investors like pension funds, insurance companies, and renewable infrastructure funds – together can play a critical role in scaling up renewable energy investment. Such investors can fund major parts of the project for a longer period at lower

interest rates. Investment from the private sector has helped some of the SAARC nations to fast track implementation of renewable energy programmes. These programmes are designed by individual SAARC member state to provide electricity to poor people living remote location. For example, in Bangladesh, the Grameen Shakti project has funded half a million solar home systems. Development of indigenous technology capacity in Nepal has lowered equipment costs for biogas and micro-hydro systems. India has leveraged public-private partnerships in its rural electrification efforts, bringing electricity to 32 million households over the past decade.

The report concludes with the proposed recommendation for mobilization of regional and international funds in SAARC member states.

a. SAARC nation should design effective Public Private Partnership (PPP) mechanisms

Development of GRID infrastructure and large-scale renewable energy projects are very capital intensive. The model can be devised at a country level and can be changed based on risk associated to the different type of projects. PPP model is one of the effective ways of attracting investment from private investors. PPP mechanisms may enable direct public spending by governments more efficiently and with more precision, without the adverse effects of alternative government programmes such as subsidies or tax waivers. PPP offers multiple advantages:

- It reduces the project life-cycle cost and administrative cost specially in case of third-party financing
- It helps allocate risk in a better way between public and private sectors
- It provides better incentives and greater commercial value for public sector assets
- It provides faster implementation as private sector may be better equipped to deliver the services

For example, IFC helped the government of Madhya Pradesh state structure and tender a PPP for the 750 MW REWA solar park, which is one of the world's largest single–site solar plants. IFC also created an innovative power distribution model enabling the Delhi metro to take energy straight from the park to power its trains.

b. Use of Risk Mitigation Instruments

Both domestic and international investors have underutilized the financial instruments. These financial instruments include Guarantees and insurances. One of the prime reasons is that the investors are not aware of the available financial instruments. Second reason is non-availability of financial instruments in each country. These instruments will help mitigate the risk like political risk, policy and regulatory risk, power-off taker risk, technology risk, etc.,

that are perceived by the investors. The government should proactively build instruments that can be easily availed by the investors. The government should actively support private institutions, which design and provide guarantees and insurances for the renewable energy sector. To build an effective instrument, the government and local entity should collaborate with foreign entities, which are active in mature renewable energy markets like USA, Germany, China, etc. These risk mitigation instruments should be available to the investors during the initial phase of project development. The national policy makers, developers, investors and other stakeholders should also be briefed on the importance of financial instruments.

The institution procedures should be streamlined to make sure the financial instruments are available to the investors. A standard risk assessment template should be prepared so the potential risks pertaining to a project can be identified. In addition, the template can be used across all the renewable energy projects.

c. Encourage local financial institutions to invest in renewable energy projects

Public finance institutions can play an important role in improving project readiness and attractiveness. As the SAARC member states have plans to scale up renewable energy installation at a faster pace, the increase in involvement of local banks will help the states to achieve the desired renewable energy targets. Local financial institutes can provide a bridge finance for projects in initial stages. The government should take necessary actions to increase the capacity of domestic banks, as it will improve access to capital at the local level. Lack of awareness and high project risks are the major reason because of which the local banks and institutions are inactive in renewable energy sector. The local institute can actively promote the use of innovative financial instruments like Green bonds, Infrastructure Investment Trusts, Carbon financing and small-scale project financing.

The government should develop plans, which will mitigate risks that are associated with renewable energy projects from the lenders (domestic and foreign investors) point of view.

In India, local banks have played a major role in providing long-term loans to project promoters. It has helped implement large-scale solar projects, which required large capital investments. The government of India (GoI) has set up solar parks across various states. The risk for the investor was minimized as the GoI had acquired the land and built grid infrastructure for power off take from the solar plants.

d. Create Renewable Energy specific policy and incentives

The investors should be provided with incentives that reflect different stages of development from R&D to commercial use of renewable energy technology. Address specific market barriers, reward innovation and be cost effective. The policymakers should encourage fixed

price schemes and provide market-based instruments such as carbon trading schemes. Policies at the regional level should encourage energy trade between SAARC member states. It will ensure long-term sustainability in the region and development of economy in line with the vision of SAARC energy charter treaty. Each country should develop specific policies and incentives like tax exemption, minimum or no import duty on renewable energy related imported equipment, accelerated depreciation, etc.

The SAARC member states should focus on setting up renewable energy specific targets at both country and regional level. The goals should be set on yearly, 5 years, 10 years basis as it will help the country to effectively track the development in this sector.

e. Facilitating decentralized renewable energy solution

Access to modern energy is an essential driver for socio-economic development in the region where millions of people still lack access to electricity and rely on traditional biomass for heating and cooking. To overcome the challenge, SAARC member states should consider both on- and off-grid solutions to reach universal access in a timely manner. These should identify areas to be served through each solution and implications for when the national grid arrives. Before executing such plans, it is necessary to understand the existing practices and projects that should be considered along with the potential to scale up. Solar energy is one of the effective solutions to the off-grid problem especially in SAARC countries.

For example, in Myanmar, thousands of small-hydro and biomass gasifiers have been deployed to provide a wide range of consumptive and productive energy services in rural areas.

f. Institutional Framework with roles and responsibilities at the SAARC level:

A central, independent, mission-driven organization at the SAARC level should be set up. There would be appropriate ownership, with establishment of shared governance and control of project prioritization. A partnership element between member states and international donors could include agreed goals and success criteria.

g. Cross-Border programmes, collaborations and cooperation for development of renewable energy sector:

There is huge potential for regional cooperation especially in the renewable energy sector, which is still in the developing stage in most SAARC countries. Broadly the three main areas of cooperation identified are:

- Cooperation among government entities for policy formation, targeted interventions and on the ground execution of renewable energy projects
- Cooperation among financial institutions such as local financial institutions and

formation of a regional guarantee fund

- Cooperation among a range of other stakeholders from across the public, private, academic and non-profit sectors

1. Introduction

1.1. Background

SAARC (South Asian Association for Regional Cooperation)

The South Asian Association for Regional Cooperation (SAARC) was established with the signing of the SAARC Charter in Dhaka on December 8th, 1985. SAARC comprises of eight Member States: Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. The Secretariat of the Association was set up in Kathmandu on January 17th, 1987.

The objectives of the Association as outlined in the SAARC Charter are:

- To promote the welfare of the peoples of South Asia and to improve their quality of life
- To accelerate economic growth, social progress and cultural development in the region and to provide all individuals the opportunity to live in dignity and to realize their full potentials
- To promote and strengthen collective self-reliance among the countries of South Asia
- To contribute to mutual trust, understanding and appreciation of one another's problems
- To promote active collaboration and mutual assistance in the economic, social, cultural, technical and scientific fields
- To strengthen cooperation with other developing countries
- To strengthen cooperation among themselves in international forums on matters of common interests
- To cooperate with international and regional organizations with similar aims and purposes.

Growth Prospects in SAARC region

According to a World Bank report, the region will witness a firm economic growth of 7.1% in 2018 as compared to 6.9% in 2017. Implementation of right mix of policies and reforms will be crucial to achieve the desired growth level. Over the next two years, the SAARC region would be one of the fastest growing regions in the world. The Growth prospect assumes that the domestic consumption will remain strong, private sector investment will regain momentum and exports will recover. According to South Asia Economic Focus (SAEF), the South Asian region has the potential to exceed the growth rates of East Asia and the Pacific. The region combined has the highest number of young people who have reached working

age. The governments have taken key initiatives to develop these young people, as it will help create an industry ready workforce.

- In **Afghanistan**, recent developments in Agriculture, mining and regional connectivity is creating job opportunities and growth prospects for the country.
- Economic growth in **Bangladesh** remains strong with growing production, remittances and investment. With low interest rates and improved infrastructure, it will lift investment in the country. The government has supported grass-roots initiatives in economic inclusion. The garment manufacturing industry is one of the booming sectors, which has increased exports, and created job opportunities.
- **Bhutan** is extensively focusing on development of hydropower projects to increase their power exports to neighboring countries. As a result, it will further create employment opportunities in Bhutan. The country has been also focusing on the tourism sector, as it will help generate revenues for the small and medium enterprises.
- **India's** economy has recovered from the withdrawal of large denomination bank notes and the Goods and service tax (GST). A series of major reforms, which have been undertaken over the past year, has allowed real GDP to reach 6% in 2018-19.
- In **Maldives,** economic growth is vastly driven by tourism and construction. The Country is investing on renewable energy projects to provide electricity to different islands. With such initiatives in place, private investors have shown interest investing in renewable energy projects. It will help reduce the country's imports of fossil fuels significantly. The country also plans to boost the tourism industry as it contributes to a third of the GDP.

Table 1: GDP Growth Forecasts in South Asia by Country[1]

GDP Growth	2018	2019 (Est)	2020 (f)	2021 (f)
Afghanistan (CY)	1.8	2.5	3.0	3.5
Bangladesh (FY)	7.9	8.1	7.2	7.3
Bhutan (CY)	4.6	5	7.4	5.9
India (FY)	6.8	6	6.9	7.2
Maldives (CY)	6.7	5.2	5.5	5.6
Nepal (FY)	6.7	7.1	6.4	6.5
Pakistan (FY)	5.5	3.3	2.4	3

[1] (World Bank, n.d.)

GDP Growth	2018	2019 (Est)	2020 (f)	2021 (f)
Sri Lanka (CY)	3.2	2.7	3.3	3.7

- **Nepal** has seen an economic recovery after disruption from earthquakes. The government has taken steady steps which resulted in better supply of electricity and availability of construction materials. As a result, the agriculture sector is expected to grow substantially. The projected growth in service sector will be 5.5% in 2018, resulting from an expansion of the financial intermediation, wholesale and retail trade and tourism subsectors.
- In **Pakistan,** economic growth is supported by major infrastructure projects and low interest rates. With efforts to further improve the trade and to implement reforms, the country will accelerate growth and improve welfare of the people. The country's economy will continue to grow with robust domestic demand supported by strong credit growth and projects related to the China-Pakistan Economic Corridor.
- **Sri Lanka's** economic performance has been improving on a year-on-year basis post 2015. With better reforms to promote competitiveness, better governance and a more balanced budget, the country has ensured sustained growth. The Sri Lankan government has plans to diversify its economy with a move to new sources of growth and jobs opening to trade.

While ensuring sustainable high-level economic growth in region, growth in the power sector will play a crucial role. The power sector forms one of the fundamental inputs to the economy. But despite the impressive macroeconomic growth, the power sector in the region has not been able to keep pace. The existing power shortages and growing import of fossil fuels impose a heavy cost of energy. The region continues to witness electricity shortages and poor quality of supply of power due to various factors like:

- Sub-optimal utilization of energy resources- both domestic & imported
- Inadequate investments
- Lack of supporting infrastructure

Lack of investments in electricity generation, transmission, and distribution restricts the development in manufacturing/industry and other key economic activities. Therefore, it limits GDP growth of the region. Shortage of electricity also affects other aspects of the country like education, healthcare, economic progress, scientific research, quality of life, prosperity, and happiness in the region.

The projected demand for electricity is expected to grow at a CAGR of 7.4 percent as mentioned in Table 2. This calls for significant investment in sustainable utilization of the

energy resources and it calls for new approaches to regional cooperation for energy resources utilization and the development of its associated electricity generation, transmission and distribution infrastructures.

Table 2: Demand for Energy in SAARC Countries[2]

Country	Demand (GWh)		CAGR %	Key Generation Resources
	Year 2010	Year 2020		
Afghanistan	2,600	6,750	10	Hydro, Oil
Bangladesh	28,470	67,400	9	Natural Gas
Bhutan	1,749	3,430	7	Hydro
India	938,000	1,845,000	7	Coal, Hydro, Wind, Solar
Maldives	800	1,300	5	Oil
Nepal	3,200	6,910	8	Hydro
Pakistan	95,000	246,000	10	Coal, Natural Gas, Hydro
Sri Lanka	10,718	21,040	7	Hydro, Oil
Total	**10,80,537**	**21,97,830**	**7.4**	

Renewable energy is an inevitable choice for South Asian countries to secure their electricity supply and to facilitate greenhouse gas mitigation. It will help these countries to move towards reducing greenhouse emissions and reduce dependency on fossil fuels. Most importantly, it will act as a catalyst in reaching out to the last mile connectivity and giving access to electricity. Geographically, South Asian countries are in a region of different climatic condition such as tropical, humid, etc. Such conditions provide easy access to a variety of renewable energy sources. The governments of South Asian countries have initiated the development renewable energy policies as it will encourage industries and individuals to employ renewable energy powered systems in power applications.

1.2. Introduction to SEC

SAARC Energy Centre (SEC) was created through the Dhaka Declaration, in 2005, to establish an Energy Ring in South Asia. It started its journey from March 1st, 2006 in Islamabad, Pakistan. SEC provides an essential element for economic prosperity of the region. It also works towards satisfaction of energy demand of the Member States. The organization is converting energy challenges into opportunities for development. It is the platform, which

[2] (Cross Border Electricity Trade in South Asia: Challenges and Investment Opportunities)

involves officials, experts, academia, environmentalists and NGOs to tap potentials of cooperation in energy sector including development of hydropower, renewable and alternative energy, promoting technology transfer, energy trade, energy conservation and efficiency improvement in the region.

1.2.1. SEC's role in promotion of renewable energy in the region

SAARC Energy Centre through its capacity building Programme activities has been conducting knowledge workshops, seminars and training courses in various fields of energy sector, including renewable energy. Over the years, SEC has been conducting various studies on power sectors which includes all three aspects i.e. generation, transmission and distribution. Hence, SEC will play a crucial role in the process of developing the RE sector in SAARC region.

1.2.2. SEC's role with respect to the study

SEC has commissioned this study in order to understand the current situation of investments in renewable energy in SAARC nations, discover the best ways to attract external finance, study the policies that have worked in other countries and give an impetus to renewable energy investments in member nations while bolstering regional cooperation.

1.3. Role played by SAARC Development Fund

1.3.1. SDF: Introduction and Achievements

In the past, SDF has collaborated with multilateral organizations like ADB, the World Bank, UNICEF, UNDP, and SAARC arbitration council, SIDBI, South Asian University, and SCCI. Soon SDF is expected to sign an MoU with Asian Infrastructure & Investment Bank, New Development Bank (NDB), European Investment Bank (EIB), Japan International Corporation Agency, and EXIM bank. SDF has received a total fund of USD 488.172 million, consisting of USD 297.835 million as capital subscription. Currently, SDF is funding a total of 11 on-going projects and 3 other projects which are in the pipeline of a total commitment of USD 73.55 million. Recently, SDF has approved two energy projects in Nepal and Sri Lanka with a total commitment of USD 30 million3. The Energy generated from the project will be supplied to the grids in Nepal, Bangladesh and India. Apart from this, SDF has committed USD 15 million to energy project in Sri Lanka where the municipal waste will be converted to electricity and supplied to the grid.

1.3.2. Existing tools and processes used for financing renewable energy projects in the region

According to SDF, the following resources and facilities will be utilized for funding:

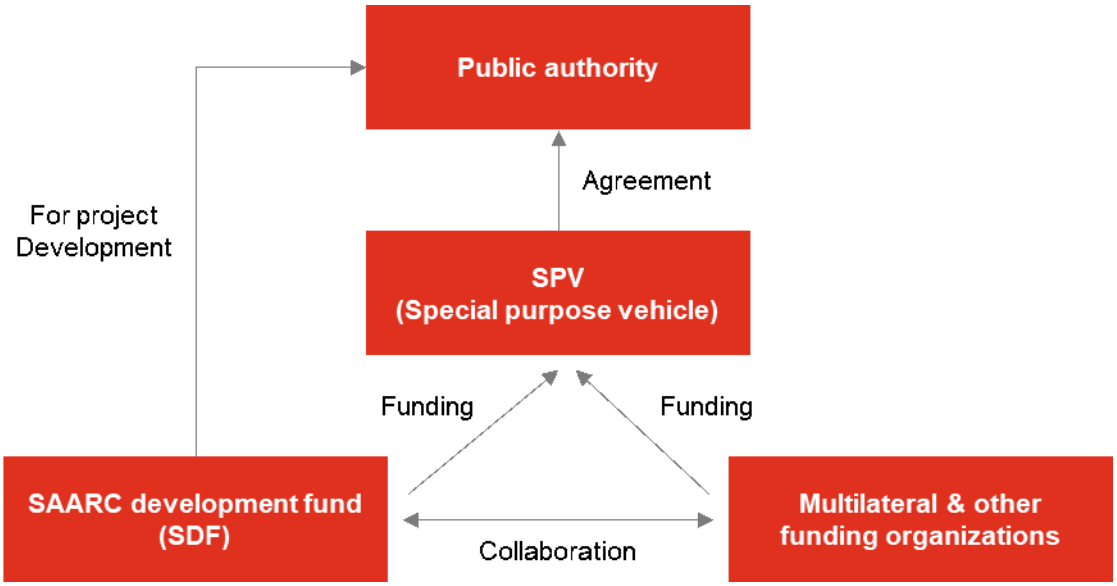
[3] (Business Standard, n.d.)

- Projects / programs involving any one or more than one SAARC Member State with the direct benefit going to more than one Member State;
- Projects located in more than one or more SAARC Member State, of significant economic interest for two or more SAARC Member States; and
- Projects with significant focus on poverty alleviation, as envisaged under the Social Window, in any SAARC Member State having thematic linkage with more than one SAARC Member States as part of a sub-regional project.
- The Governing Council may determine any other criteria for funding of projects.
- The Fund shall primarily finance longer-term priority regional programs and projects.
- The Fund shall offer concessional and non-concessional funds as well as grants.

SDF fund strategy for funding PPP projects

The SDF will only co-fund the Project /Programme at the initial stage and shall not be a sole lender. Maximum amount of loan allocated per project will be USD 20 million. SDF also extends loans in both USD and local currencies of SAARC Member States to reduce the currency risk factor.

Figure 1: Funding Process of SDF[4]



The above flow chart gives a brief on the funding process for a project. There are majorly two lenders, i.e. SDF and multilateral/other funding organizations. SDF will lend a maximum of USD 20 million per project for a tenure of 20 years, which may vary from project to project. Other funding organization like local bank and private investors shall infuse the balance

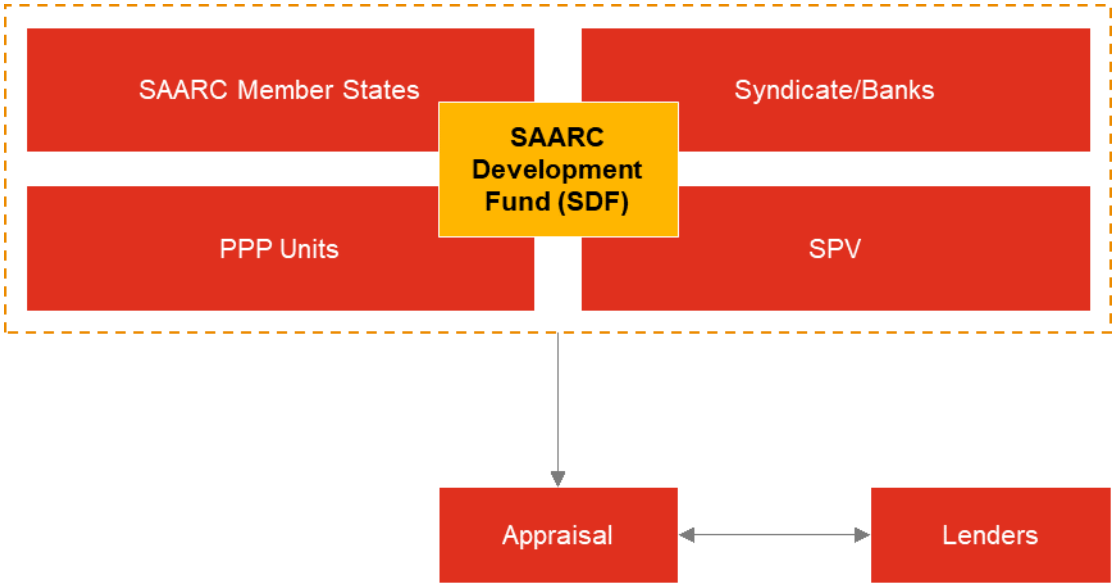
[4] (United Nations Economic and Social Commission for Asia and the Pacific, n.d.)

amount. The overall funding process of both SDF and funding organizations will be in collaboration with each other. The funds received from the lenders will be funded to SPV, which will agree with the public authority of respective SAARC country. These funds will be released to the public authority by an SPV entity. SDF will be actively involved in the project development cycle with the respective public authority. As per funding terms of SDF, a maximum concession of 2% p.a shall be given on a case-to-case basis over the market rate.

SDF's process flow for funding of PPP projects

SDF receives projects proposals from SAARC Member States, Syndicate / Banks, PPP Units and SPV(s). The projects proposals are evaluated in terms of economic, social and financial liability. The evaluation provides information on the nature, extent and potential impact and sustainability of the project. The evaluation also assessed the project design, scope, implementation status and the capacity to achieve the project objectives.

Figure 2: SDF Structure[5]



Based on all these parameters, the projects are either accepted or rejected. The objective is to ensure the proper utilization of SDF Funds on the project activities as defined in the Sanction Letter/ Term Sheet, Project Finance Agreement (PFA), log frame, and approved budget shared with the grant recipients/ beneficiaries/borrowers.

1.3.3. Mandate to facilitate mobilization of renewable energy funding

The mandate of SDF includes promotion of welfare of the people in SAARC Region, improve their quality of life, accelerate economic growth, social progress and poverty alleviation in

[5] (United Nations Economic and Social Commission for Asia and the Pacific, n.d.)

the region, and strengthen regional integration and cooperation among the Member States through project collaboration. Strategic advantages of SDF includes:

- Umbrella financial institution of SAARC projects and programs.
- Funding priority regional projects
- Bring synergies of 8 member states
- Sharing of regional best practices

1.4. Rationale/Purpose of the Study

The rationale behind the study is to place the SAARC nations at par with the developed nations across the globe. This requires developing the RE sector by facilitating regional cooperation and exploring efficient modes of financing that are customized to the special needs of its member nations.

1.5. Objective of Study

Across the globe, countries are seeking scale-up the RE investment. This shift towards renewable based energy, especially in the SAARC member states has been driven by various aspects such as:

- Countries struggling to meet fast-growing energy demand.
- Rising global fuel prices and resource scarcities.
- The technology cost of renewable energy, especially solar, has been rapidly falling over the past decades
- The emphasis on clean energy has been heightened with several countries committing to the INDC targets set during the Paris Agreement.

However, the barriers confronting a full-scale transition to renewable energy lies not just with technology costs but also with the challenges of securing long-term affordable finance. This study shall try to identify the key risks associated with the investment in renewable energy capacity, and thus help decision-makers compare different public instruments. This will be followed by shaping new instruments to improve their effectiveness in mobilizing private and public investment in renewable energy. The study also aims to discuss possible directions for enhancing the effectiveness and efficiency of public finance to catalyse private investment in RE and provide universal access to clean, secure and affordable energy services.

1.6. Scope of the Study

The scope of study broadly divided into 4 phases:

- Briefly cover the need of renewable energy among the SAARC Member States, the status of the sector focusing on recent investments since 2012 and various programmes run by the government. This would be followed by barriers in the sector, lack of financing (to the developers) being one of them and followed by the opportunities in the future.
- Economics of different options highlighting the risk return expectations of the investors. Following this would be the issues faced by the developers in the form of lack of financing and hence the need of private sector finance.
- Existing international and regional financial instruments along with upcoming innovative financial instruments. The key to the section is to highlight where and how the instrument can be used along with expected outcomes from the same. The same needs to be explained with successful case studies from across the globe. An analysis covering the pros and cons of the same is necessary along with mapping the issues of the project developer with probable funding instruments.
- Current financing approaches for each SAARC Member State, along with analysis of their outputs and key challenges faced. This would be followed by probable risk mitigation measures for increasing their effectiveness.

1.7. Methodology of Study

Figure 3: Study of the renewable energy market in SAARC countries

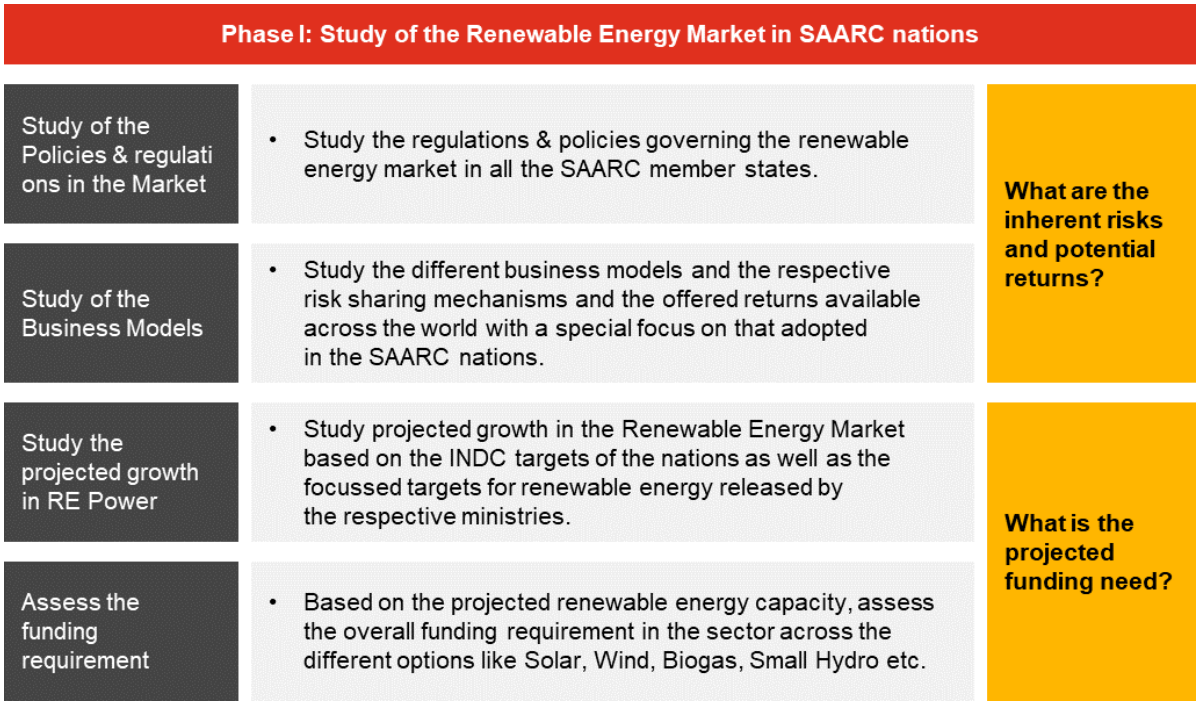


Figure 4: Study of the Investors' Profile

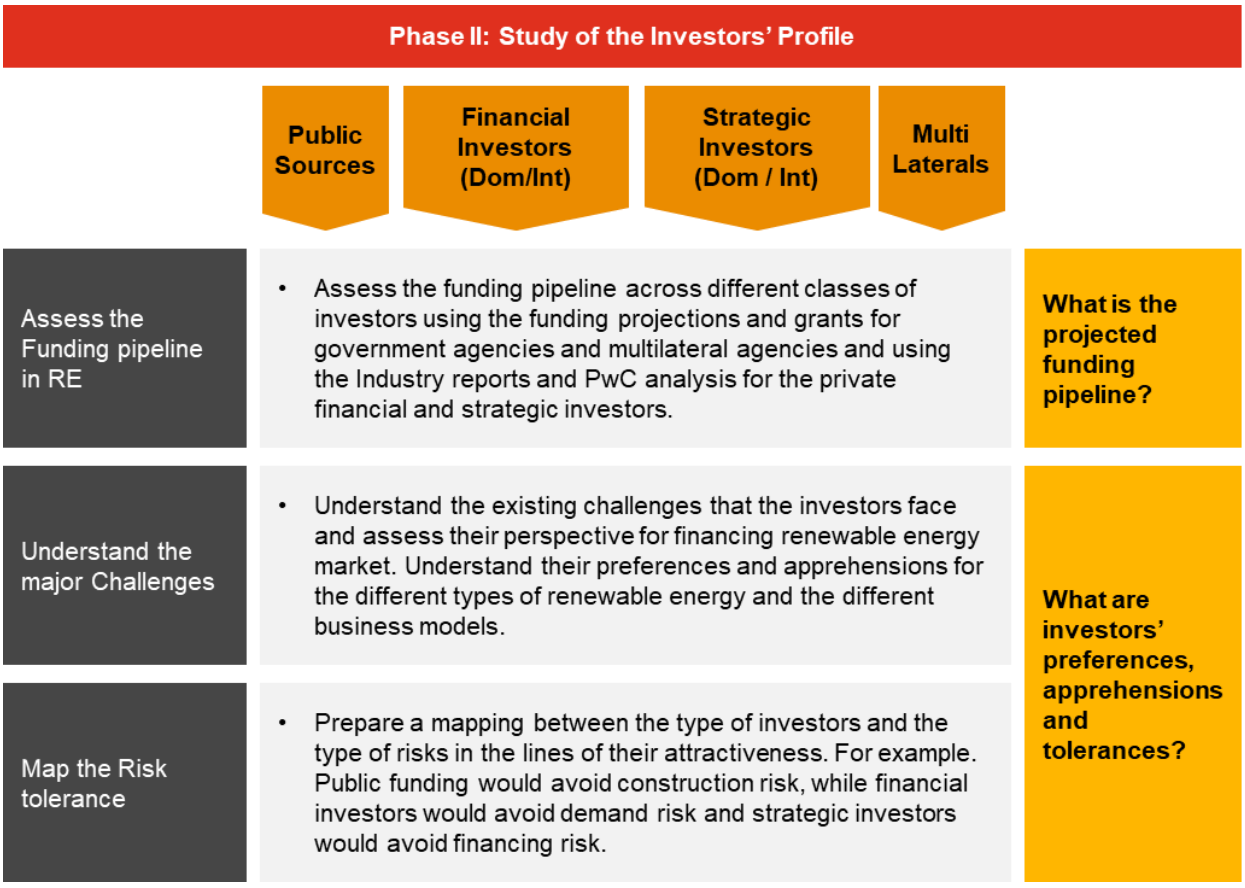


Figure 5: Understanding the Policy & Financial Instruments available

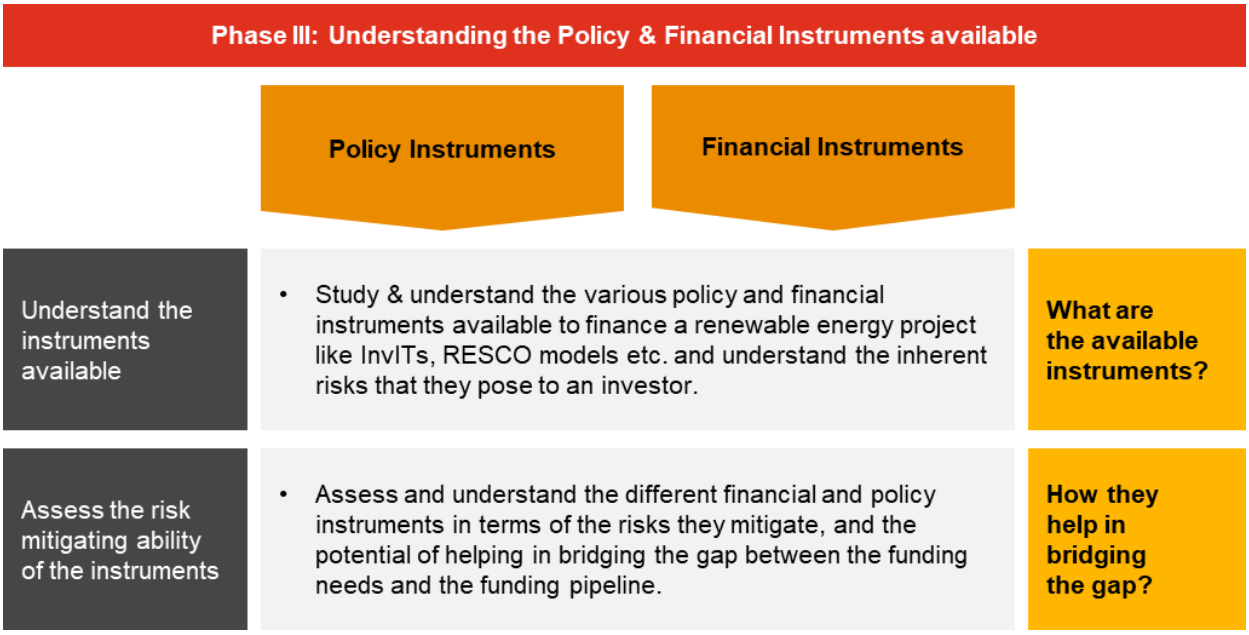
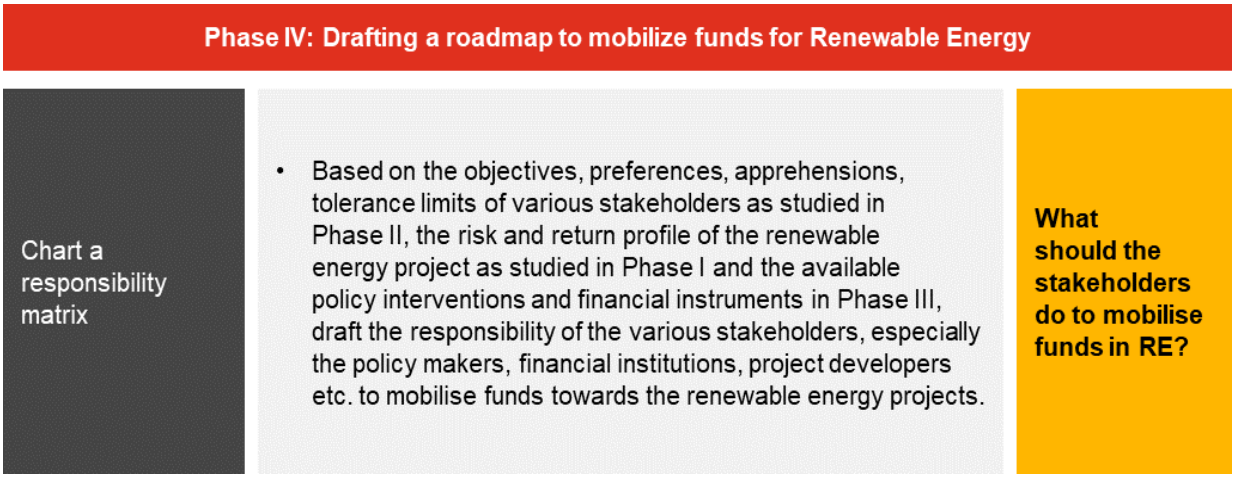


Figure 6: Drafting a roadmap to mobilize funds for Renewable Energy



1.8. Limitations of Study

- Our analysis and data collection are based on public sources of information such industry studies, journals, publications and various research databases.
- We have relied on data/information/report shared by SEC relevant for the study.
- The study undertaken is limited to secondary sources and discussion only and no primary research has been undertaken for the assignment.
- During analysis and benchmarking, we have relied on widely acceptable norms in case the actual information is unavailable.

2. Renewable Energy Landscape – SAARC Outlook

2.1. Need of Renewable Energy

Energy access is the "golden thread" that weaves together economic growth, human development and environmental sustainability. Since 2000, half a billion people have gained access to electricity in SAARC nations – one of the largest electrification success stories in history. However, a sizeable portion of the SAARC population is still living without reliable access to electricity. The per capita electricity consumption in all SAARC countries is far lower than that of the developed world. The table below gives the country wise electricity access and consumption figures.

Table 3: Electricity Access of SAARC Countries

Country	Population access to electricity[6] (2017) (%)	Per Capita Electricity Consumption[7] (kWh)
Afghanistan	97.7	119.8
Bangladesh	88.0	278.1
Bhutan	97.7	2779.0
India	92.6	644.0
Maldives	99.8	763.0
Nepal	95.5	454.1
Pakistan	70.8	457.0
Sri Lanka	97.5	636.3

USA = 12,984 kWh
Japan = 7,820 kWh

In order to bridge this gap in per capita electricity consumption and to keep pace with the growing demand for energy in SAARC nations, the supply of energy needs to increase substantially. However, conventional sources of energy alone cannot keep pace with the increased demand as they are fast depleting and often need to be imported from other nations leading to greater dependence on fluctuating fuel prices. Renewable Energy is the best solution for this energy conundrum. The technology has evolved to the point renewable energy tariffs are on par with

[6] (Sustainable Energy for ALL (SE4ALL) database, n.d.)
[7] (Science Direct, n.d.)

conventional fuel tariffs and is the way forward for a cleaner and greener world focusing on sustainable growth.

Each country in the SAARC region is unique in terms of its geography and the natural resources that it has been endowed with. As a result, there is wide variation in the way the countries fulfil their energy needs. Afghanistan being a landlocked country meets 83% of its energy needs through imports mainly from Uzbekistan, Iran, and Turkmenistan. Bangladesh produces most of its energy using internal natural gas which is fast depleting and imported oil. Bhutan is an energy exporting nation with 100% of its energy being produced from hydroelectricity. India has a resource mix of 62.43% thermal, 12.31% hydro and 23.41% renewable. Domestic coal has traditionally been the main fuel used in India's power plants. However, in recent times, India is running one of the largest and most ambitious renewable capacity expansion programs in the world. Maldives being an island nation meets all its energy demand using imported oil. Nepal is rich in hydro resources due to its terrain and produces 62.75% of energy from hydroelectricity. Pakistan's energy mix is 62.1% thermal energy, 25.8% hydro, 8.2% nuclear and 4% renewable energy. Pakistan has traditionally used imported oil and domestic gas to produce electricity. Sri Lanka's energy mix comprises of 75.79% thermal energy using imported fuels, 22% hydro and 1.52% renewable. The SAARC member states should focus on providing a thrust on renewable energy development to reduce the exposure to fluctuating fuel prices and import on fuels.

In recent years, the world has seen an increase in temperatures around the Earth and weather patterns such as stronger and more frequent storms, floods and tornadoes occurring. The energy sector is the largest source of greenhouse gas (GHG) emissions. According to a report, it is estimated that energy-related emissions will increase by about 16% by 2040. They cause environmental degradation and release of harmful gases to the atmosphere spread from the exploitation and use of fossil energy sources. Hence, there is an urgent need for the SAARC member states to diversify its energy mix to meet their energy demands. There is a need to increase renewable energy uptake such as hydro, solar, biogas and wind resources into rural and urban energy planning.

At a global level, there is a steady decline in cost of electricity produced by the renewable energy especially from solar and wind technologies. Renewable energy technology has become a very competitive means of meeting the generation targets. The global weighted average cost of electricity was USD 0.05/kWh from new hydropower projects, USD 0.06/kWh for onshore wind and USD 0.07 kWh for bioenergy and geothermal projects. The key reasons behind cost reduction are:

- Technology improvements

- Competitive procurement
- Larger base of experienced and presence of active project developers across the countries.

There is rapid technology growth in the renewable power generation market. Due to the economies of scale, the production cost and product cost has reduced significantly. With development in the renewable energy equipment prototypes, the installation costs have reduced with easy installations. Falling renewable power costs signals a real paradigm shift in the competitiveness of different power generation options especially in solar PV and onshore wind projects. As a result, electricity produced from renewables will soon be cheaper than electricity produced from fossil fuels. According to a report by IRENA[8], by 2020 all the power generation technologies that are now in commercial use will fall within the fossil fuel-fired cost range.

2.2. The Current Status - Is the potential being met?

The following section contains a detailed breakup of the energy mix of each of the SAARC member states. This is how they are currently sourcing their energy needs. The renewable energy currently holds a relatively small share in this mix. However, there is huge potential for increasing this share as each of the SAARC nations are endowed with abundant natural resources which can be harnessed to produce electricity. The government needs to play a pivotal role in order to set the ball rolling for increased renewable energy investment through well formulated stable policies that attract private investors and give them confidence.

2.2.1. Current Installed Capacities

The below mentioned tables provides details on the installed capacity of power plant and the resource mix.

Table 4: Energy Landscape in SAARC Countries

Country (year of data)	Installed Generation Capacity (MW)	Peak Demand (MW)	Resource Mix				
			Thermal[9] (%)	Nuclear (%)	Hydro (%)	Renewables (%)	Imported (%)
Afghanistan[10] (2019)	655	-	3.23	-	13.17	-	83.59

[8] (Renewable power generation cost 2017-IRENA)
[9] Thermal includes coal, gas, lignite and oil-based plants
[10] (Afghanistan Statistical Yearbook 2018-19)

Country (year of data)	Installed Generation Capacity (MW)	Peak Demand (MW)	Resource Mix				
Bangladesh[11] (2020)	21,825	15,116	83.18	-	1.05	1.42	5.31
Bhutan[12] (2017)	1,615	335.87	-	-	100	-	-
India[13] (2020)	3,68,690	1,71,796	62.43	1.84	12.31	23.41	-
Maldives[14] (2017)	240	284	100	-	-	-	-
Nepal[15] (2019)	1,182	1,320.28	-	-	62.75	-	37.25
Pakistan[16] (2019)	34,282	25,713	62.1	8.2	25.8	3.9	-
Sri-Lanka[17] (2019)	4,017	2,543	75.79	-	22.06	1.52	-

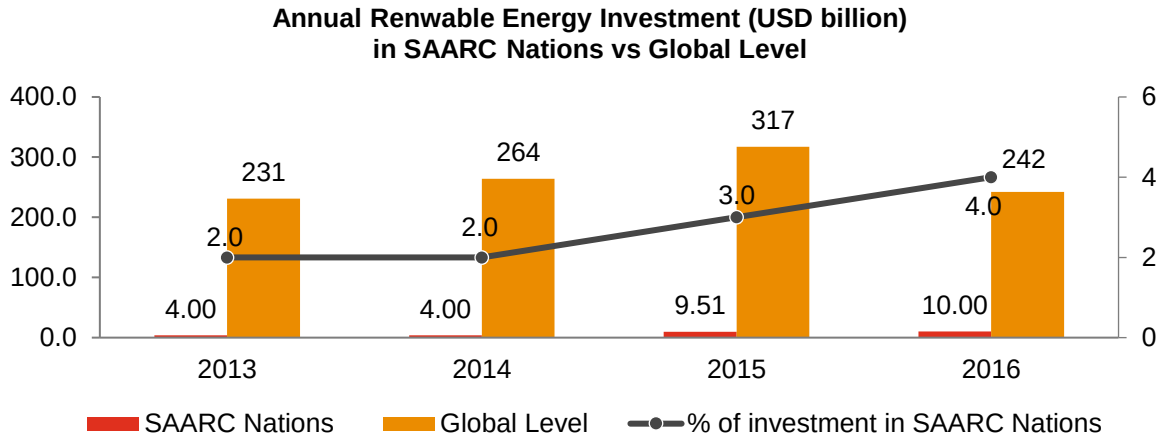
2.3. Investments in the Renewable Energy Domain

There has been a major policy drive in renewable energy investment decisions and trends that vary from region to region. Extensive investment has been in onshore wind and solar PV power sector. The East Asia-Pacific region was a lucrative destination for the investors with a total investment of USD 88 billion. The SAARC nation's initiative towards adoption of renewable energy, has led to significant investment in the renewable energy sector. The investments in SAARC member states have almost doubled to ~USD 10 billion in 2016 from ~USD 4 billion in 2013. The growth was driven by strong investment in India with some investment in Bangladesh, Pakistan and Sri Lanka. Despite a decline in the investment at global level, the percentage of

investment in SAARC nations has grown to ~4% in 2016 from ~3% in 2015. With further reforms in policies at investor's level, the SAARC nations are expected to attract more investments in the coming future.

[11] (Sustainable And Renewable Energy Development Authority (SREDA), n.d.)
[12] (SAARC Study Planning Criteria, Dec 2017)
[13] (Central Electricity Authority, n.d.)
[14] (SAARC Study Planning Criteria, Dec 2017)
[15] (Nepal Electricity Authority Annual Report 2018-19)
[16] (Pakistan Economic Survey 2018-19)
[17] (Ceylon Electicity Board , n.d.)

Figure 7: Annual Renewable Energy Investment (USD billion) in SAARC Nations vs Global Level[18]



The country wise and technology wise break up of installed capacities in the renewable energy sector have been given in table 5. Countries such as Bhutan and Nepal have historically seen investments in hydroelectricity. The other SAARC nations are catching up and the past few years have seen huge investments especially in solar and wind technologies and a sharp increase in renewable energy installed capacities.

Table 5: Current Renewable Energy Sector Profile[19]

Country	Solar (MW)	Wind (MW)	Hydro (MW)	Biogas (MW)	Total (MW)
Afghanistan	22	-	333	-	355
Bhutan	-	-	1,615	-	1615
Bangladesh[20]	76.17	2.90	230	1.03	310.10
India[21]	34,035.66	37,607.7	4,676.56	10,001	86321.03
Maldives	9	1	-	-	10
Nepal	53	-	1,059	-	1,112
Pakistan	1,568	1,186	9,900	396	13,050
Sri Lanka	159	146	1,741	45	2,091

Afghanistan:

Afghanistan is a land locked country with tremendous solar and wind energy potential. Efforts are on in Afghanistan to develop large renewable energy projects in order to get a more

[18] (Global landscape of renewable energy finance 2018)
[19] (IRENA-Renewable Capacity Statistics 2019)
[20] (Sustainable And Renewable Energy Development Authority (SREDA), n.d.)
[21] (Ministry of New and Renewable Energy, n.d.)

balanced energy mix, which is, not to rely so heavily on imports. Some of the recent initiatives include 1 MW off-grid solar plant in Bamyan, and 2.2 MW of solar and micro hydro power (MHP) projects in Takhar and Badakhshan provinces. Although it is unclear how much in kW of wind power is installed in Afghanistan due to lack of any industry reporting mechanism, it is estimated that total installed capacity of wind power is about 300 kW with the largest wind power system of 100 kW in the mountainous province of Panjshir. In addition, donors have also supported technical assistance and capacity building activities. Technical and operational guidelines for MHP and photovoltaic power systems, and technical handbook for micro hydro design have been developed. An online renewable energy database of projects has been prepared. Currently 4945 renewable energy projects consisting of MHP, wind and solar are completed and 496 are under construction. The total installed capacity of these completed and under construction projects is 57,410 kW. Another 98 projects are in planning stage. The involvement of private sector through the newly created industry association with the donors in Public-Private-Partnership (PPP) mode could be a beginning of this growth trajectory.

Bhutan:

Bhutan is a carbon neutral and net energy surplus country. Not only is Bhutan carbon neutral, it is also a carbon sink. Energy export is one of the main revenue sources of the Bhutan government. The use of biomass and hydroelectricity is predominant in most sectors. Efforts are on to further develop hydro resources in the country to increase exports to neighbouring nations. The use of biomass for domestic energy needs is a predominant feature of the Bhutanese households. Traditionally, the Bhutanese people have had a strong belief in respect for the environment and sustainable growth.

Bangladesh:

In Bangladesh, a lot more work has been done in the off grid renewable energy space and energy efficiency space. Because of the geographical characteristics of the country, most of the renewable energy projects are based on solar PV technology. A state-owned development financial institution dedicated to promote/finance infrastructure and renewable energy projects in Bangladesh named ‘Infrastructure Development Company Limited (IDCOL)’ has started the solar home system (SHS) program in 2003 to ensure access to clean electricity for the electricity starved off-grid rural areas of Bangladesh. About 4 million SHSs have already been installed under the program in the off-grid rural areas of Bangladesh which has amounted to an off grid solar installed capacity of 268.29 MW

India:

India is running one of the largest and most ambitious renewable capacity expansion programs

in the world. This renewable energy push in India is riding upon innovative technologies, growing energy demand, strong wind and solar resources, policy support, and growing investments. Solar capacity has increased 370% in the last 3 years from 2.6 GW to 12.2 GW. Record low solar and wind tariffs have been achieved due to economies of scale. In the year 2016-17, aggregate capacity of around 11,322 MW of renewable energy was installed in the country, and in year 2017-18, aggregate capacity of around 11,887 MW was installed.

Maldives:

The total energy generation FY 2016 was 220 MW. Power generation through renewable energy was 6 MW i.e. 2.72% of total energy generation. Currently, power is generated from three renewable energy resources i.e. Solar, Wind and Hydro. Maldives have a total installed capacity of 214 MW of diesel generators to cater for the electricity demand. In April 2018, Ministry of Environment and Energy (MEE) has signed MoU with Kokyo Tatemono Company limited, Japan to embark on wave-harnessing clean project in the Country. The Accelerating Sustainable Private Investment in Renewable Energy project is enabling private sector investment in photovoltaic infrastructure development. ASPIRE is diversifying the investment base in the country by developing a local market and expertise in renewable energy. The project received a $16 million International Development Association guarantee from the World Bank, as well as a $11.7 million grant from the Scaling Up Renewable Energy Program.

Nepal:

Nepal has a total installed capacity of 1182 megawatts (MW) as on 2019. Of which most of the power was produced via Renewable energy(hydro). Power produced from small hydropower plants was 343.20 MW and large hydropower plants was 459.20 MW while that from solar plants was 0.10 MW. As of March 2018, as many as 113 hydropower plants are under construction. These plants will have a combined capacity of 3,090 MW once completed. Nepal has also received a funding of USD 20 million to setup 25 MW solar power by 2018.

Pakistan:

Pakistan has a total installed electricity – generation capacity of 34GW as of FY 2019. Approximately, 29.7% of electricity is generated via different renewable energy sources. Hydropower contributes to most of total power produced from Renewable Energy. The government has planned to increase wind power generation to 3500 MW by end of 2018. According to a report, China and Pakistan have recently decided to shift the focus of energy sector investments under China-Pakistan Economic Corridor (CPEC) to hydropower development.

Sri Lanka:

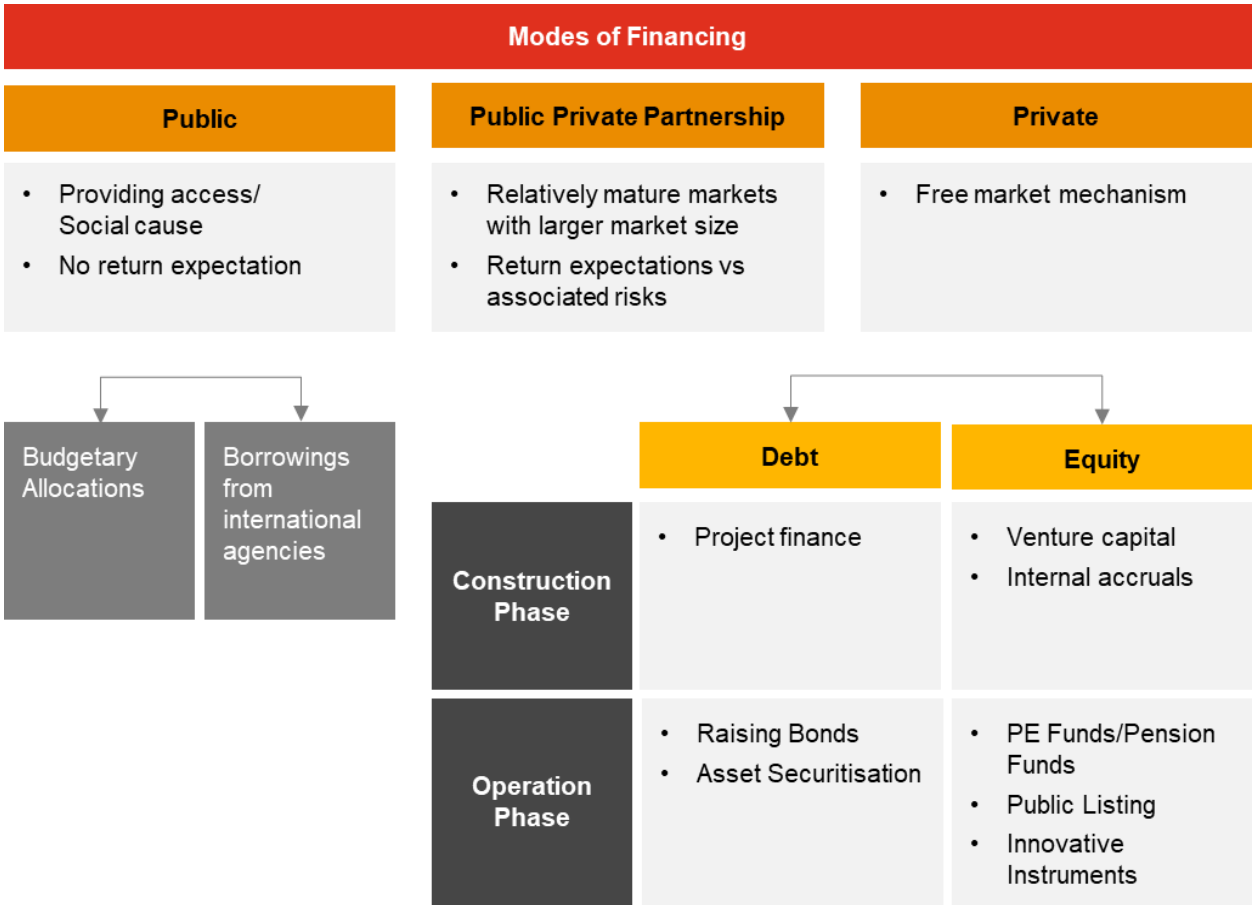
Sri Lanka has a total installed capacity of 4017 MW (as on 2019), of which 23.58% is contributed via renewable energy. With high focus on hydro projects, 22.06% of total power is contributed by Hydropower projects. According to a report, the Sri Lankan government has awarded a 10 MW solar power project to a domestic company, which will sell clean energy to CEB.

2.3.1. Modes of Financing Renewable Energy sector

There are mainly three modes of financing which countries adopt to fund their renewable energy initiatives. The first mode is through **public funding**. Countries, which need to adopt this mode, are the ones where there is very limited access to basic infrastructure, the per capita income is low, and markets are largely underdeveloped. They can choose to either fund renewable initiatives through budgetary allocations or depend on global/ multilateral agencies like the World Bank, Asian Development Bank, etc. to provide funds through loans or grants. They can also try to access grants from the developed world. The main aim here is to provide their public with basic amenities. With the main motive to provide energy access to the population, there is no return expectation involved from the funds invested. Once the public sector has been able to do its bit through efficient deployment of funds, the countries can hope to move into the more advanced modes.

The second mode of financing is through **public private partnership (PPP)**. This mode is suited for countries with markets that have attained a certain maturity and a size. PPP mode brings along the technical expertise of private players along with investments with a profit-making expectation against associated risks. The private investors are helped across by public sector entities enabling them with required approvals and infrastructure setup.

The third mode is through **pure private** investment operating in a free market and there is a return expectation for the risks undertaken. The funding requirements against each of the modes vary can happen either through debt or through equity using the various financial instruments, which have been elaborated in the ensuing chapters.



Afghanistan:

Afghanistan is in the public funding mode of financing. The government must take the lead in first formulating a renewable energy policy with set targets. They must procure as much international help in terms of policy formulation and funding as possible and only the government can drive this initiative. Its aim should be to advance to the PPP mode of financing in a set amount of time.

Bangladesh:

Bangladesh is in the PPP mode of financing as it is a mature market with a sizeable population. It can make use of financial instruments with public funding being as the trigger to attract investments. Some of the schemes of the Bangladesh government such as the solar home systems have done very well because of innovative local funding options and the dedicated efforts of the Bangladeshi government. It needs to stay in the PPP mode for a sizeable amount of time and develop its funding infrastructure further.

Bhutan:

Bhutan is a relatively small country with abundant natural resources. Bhutan has developed the sector policies and evolved from the public funding mode to the PPP funding mode. It has

to consolidate its position in the PPP funding mode by attracting investments and giving further impetus to its cross-border power trade initiatives.

India:

India has taken several initiatives in the renewables space with specific central level and state level targets. It is in the advanced stage of the PPP funding mode and can further it's already robust renewable energy sector by entering the purely private mode. This process is already underway in India.

Maldives:

Maldives is in the public funding mode as being an island nation, it has limited resources that can be tapped for renewable energy and at this point it is largely on the government to develop this sector.

Nepal:

Nepal is a small Himalayan nation with limited market maturity but abundant natural resources. However, it is in the public funding mode at this point because the basic financial infrastructure to enter the PPP mode has still not evolved.

Pakistan:

Pakistan is a sizeable market and its financial infrastructure is mature enough to handle the PPP funding mode of renewables, which is imperative for a country of this size. However, the policy framework and government initiative are lacking in the renewable energy space as priority is being given to other sectors.

Sri Lanka:

Sri Lanka is an island nation with a robust renewable energy framework and many initiatives taken by the government to develop this sector. Hence, it is currently in the PPP funding mode of financing.

2.4. Policy Support and Targets of the Government

2.4.1. Institutional Framework

Each SAARC Member State has a unique institutional structure for renewable energy sector established to satisfy local requirements. Each country has started giving utmost priority to the renewable energy sector and set up dedicated institutional arrangement for promotion and development of Renewable Energy Technologies (RETs). Different institutes in SAARC member states are given below:

Table 6: Renewable Energy Institutions in SAARC Countries

Country	Ministry	Federal Institute	Regulator	Public Financing Institute
Afghanistan	Ministry of Energy and Water	Renewable Energy Department	Ministry of Energy and Water	Non- Existent
Bangladesh	Ministry of Power, Energy & Mineral Resources	Sustainable and Renewable Energy Development Authority	Bangladesh Energy Regulatory Commission	Infrastructure Development Company Limited
Bhutan	Ministry of Economic Affairs	Department of Renewable Energy	Bhutan Electricity Authority	Non- Existent
India	Ministry of New and Renewable Energy	Energy Efficiency & Renewable Energy Management Centre	Central / State Electricity Regulatory Commission	-Indian Renewable Energy Development Rural Electrification Corporation ltd
Maldives	Ministry of Environment and Energy	State Electric Company Ltd	Maldives Energy Authority	Non- Existent
Nepal Ministry of Energy	Ministry of Energy	Alternative Energy Promotion Centre	Nepal Electricity Regulatory Commission	Non- Existent
Pakistan	Ministry of Water and Power	Alternative Energy Development Board	National Electric Power Regulatory Authority	Non- Existent
Sri Lanka	Ministry of Power and Energy	Sri Lanka Sustainable Energy Authority	Public utilities Commission of Sri Lanka	Non- Existent

Table 7: General Roles and Responsibilities of Institutions

General Roles and Responsibilities of Institutions (Pertaining to Renewable Energy sector)	
Institution	**Roles and Responsibilities**
Ministry	• Evolving General Policy in the electric power sector and issues relating to energy policy and coordination • All matters related to generation, transmission and distributions. • Providing research, development and technical assistance at central and state level across the power sector. • Administrating different law acts pertaining to power sector (both conventional and non-conventional source of power)

General Roles and Responsibilities of Institutions (Pertaining to Renewable Energy sector)	
Institution	**Roles and Responsibilities**
	• The ministry dealt with all matters relating to federal agency, regulator and financial institutions • Developing electrification plans and power schemes. • It deals with issues relating to power supply/development schemes/ programme/ decentralized and distributed generation at regional level. • It also deals with all matters concerning energy conservation and energy efficiency pertaining to power sector.
Federal Agency	• Identify Research, Design, Development and Manufacture thrust areas. • Lay down standards, specifications and performance parameters at par with international levels and facilitate industry in attaining the same • Align costs of new and renewable energy products and services with international levels and facilitate industry in attaining the same • Appropriate international level quality assurance accreditation and facilitate industry in obtaining the same • Provide sustained feed-back to manufacturers on performance parameters of new and renewable energy products and services with the aim of effecting continuous upgradation • Resource Survey, Assessment, Mapping and Dissemination. • Identify areas in which new and renewable energy products and services need to be deployed in keeping with the goal of national energy security and energy independence • Provision of cost-competitive new and renewable energy supply options
Regulator	• Issue Licenses • Set performance standards • Monitor Performance • Establish price levels and structures • Establish uniform accounting systems • Arbitrate disputes • Perform Management audits • Develop human resources • Coordinate decisions with other agencies
Public Financial Institutes	• To give financial support to specific projects and schemes for generating electricity and / or energy through new and renewable sources and conserving energy through energy efficiency. • To maintain its position as a leading organization to provide efficient and effective financing in renewable energy and energy efficiency / conservation projects. • To increase its share in the renewable energy sector by innovating financing. • Improvement in the efficiency of services provided to customers through continual improvement of systems, processes and resources.

Afghanistan:

Ministry of Energy and Water is responsible and is engaged directly with generation, transmission and distribution of electricity in the country. Apart from providing GRID power, it also actively involved in electrification in rural areas through RETs. Ministry of Rural Rehabilitation and Development (MRRD) was established for development and implementation of renewable energy programs to grow financially. Renewable Energy Department, which works directly under the supervision of Ministry of Energy and Water, is responsible for coordination and promotion of RETs.

Bangladesh:

Sustainable and Renewable Energy Development Authority (SREDA) was formed through SREDA act 2012 to promote and to facilitate renewable energy for ensuring energy security of the country. SREDA works directly under the supervision of MPEMR. It coordinates among public departments including BPDB, BREB, IDCOL and the private sector. SREDA through its approved Renewable Energy Policy 2008 aims to facilitate both public and private sector investment in renewable energy projects. It also plans to increase the production of renewable energy-based electricity generation in the country. Infrastructure Development Company limited (IDCOL) was setup to meet the required financing for renewable energy projects both medium and large scale.

Bhutan:

Ministry of Economic Affairs is the policymaking body on energy sector with 3 departments i.e. Department of Hydropower and Power Systems; Department of Renewable Energy and Department of Hydromet Services. Department of Renewable Energy (DRE) serves as central focal point on coordination and promotion of renewable energy.

India:

Ministry of New and Renewable Energy (MNRE) is a nodal ministry and facilitates research, manufacture, development and deployment of new and renewable energy systems for all applications. It acts at a central level for promotion of grid-connected and off-grid renewable energy in India. Energy Efficiency and Renewable Energy Management center is responsible to implement the programs of MNRE by enhancing total energy efficiency and application. It also formulates policies and programs for the promotion, development and implementation of alternate energy technologies. State Nodal Agencies role is to promote and to expand the growth of renewable energy in their respective states. Indian Renewable Energy Development Agency limited (IREDA) role is to develop, promote and extend financial assistance for renewable energy projects. It is also a lending organization to provide financing for projects.

Maldives:

Ministry of Environment and Energy is responsible for policy formulation and implementation with regards to climate change and energy sector. Maldives Energy Authority is the regulatory body, which advises the government organization regarding energy sector (including renewable energy). State Electric Company (STELCO) is responsible for power generation, distribution in Maldives.

Nepal:

Ministry of Energy is responsible for utilization and management of Hydropower potential. The Rural and Alternative Energy section works under Ministry of Energy. Department of Electricity development is responsible to develop and to promote electricity sector (Including renewable energy). It acts as "One Window" service and license to power projects. Alternative Energy Promotion Centre (AEPC) focus on developing and promoting rural and RETs in Nepal.

Pakistan:

Alternate Energy Development Board (AEDB) is an agency at federal level to promote, facilitate and develop RETs in Pakistan. AEDB deals with all renewable energy generation projects except for Hydel Projects. The province governments have their dedicated provincial department to promote and to encourage private sector investment in renewable energy sector. They are responsible for harnessing renewable energy resources, preparing policy, addressing issues at province level, facilitate local and foreign investors, promotion and implementation of projects. NEPRA determines the tariff for electric power services.

Sri Lanka:

Ceylon Electricity Board (CEB) is the main body, which generate, transmit and distribute most of the electrical energy in Sri Lanka. CEB is promoting electricity generation using renewable energy resources by aiding private sector. Sri Lanka Sustainable Energy Authority (SLSEA) is responsible for promotion and facilitation of renewable energy to ensure energy security and efficiency in the country. It stated working with Ministry of Environment and Renewable energy from 2012.

2.4.2. Key Programmes

Listed below are some of the key government policies of SAARC nations to give the required impetus to the renewable energy sector.

Table 8: Key Government Policies

Country	Policy	Objective
Afghanistan	• ANREP: Afghanistan National Renewable Energy Policy	**Term 1(2015-2020):** It will facilitate a transition from donor supported to private investment driven renewable energy sector **Term 2(2021-2032):** A financial institution dedicated to REN will be set up that will provide customized financial support to all REN projects of private sector, local enterprises, NGOs, women led REN businesses and others. It will pool in funds from the government resources, as well as from donors and international financial institutions such as the Asian Development Bank, Islamic Development Bank, World Bank etc.
Bangladesh	• Solar Homes Programme • Solar roof-top program • Solar Irrigation Pumps, Solar mini and nano grids	The Government financial institutions have introduced many re-financing scheme and concerted programs to diversify the renewable energy installations, under these schemes loans are being channelled through the Participating Organizations (POs) with attractive interest rates between 6-9% and at 60%-80% of project cost.
Bhutan	• Foreign Direct Investment Policy 2010 • Alternative Renewable Energy Policy 2013 • Renewable Energy Master Plan by 2016	In Bhutan, a combination of all these policies is being used for developing the renewable energy sector in the country, providing the framework to address key issues relating to the promotion of renewable energy systems and public and private sector participation
India	• Wind-Solar Hybrid Policy	Aims to achieve a hybrid wind-solar capacity of 10GW by 2022. Hybridization of the two technologies will help in: • Minimizing Variability • Optimal utilization of infrastructure including land and transmission systems
	• Renewable Purchase Obligations (RPO's)	RPO's are a mechanism by which State Electricity commissions are obliged to purchase certain percentage of power from renewable energy sources. Also, floor prices of the RPO have been set to provide certainty to companies. The floor price has been set at US$ 144 per Megawatt
	• Scheme for Development of Solar Parks and Ultra Mega Solar Power Projects	Aims to set up 25 Solar Parks and Ultra Mega Solar Power Projects targeting 20,000MW of solar power installed capacity by 2019-20. US 83.78 million have already been sanctioned under the scheme.
	• JNNSM: Jawaharlal Nehru National Solar Mission, 2010	**Phase 1(2010-13):** Under JNNSM Phase I, solar projects were allotted through a process of 'reverse bidding'. Rooftop PV and Small Solar Power Generation Programme (RPSSGP) was also introduced under the mission

Country	Policy	Objective
		Phase 2(2013-2017): Following the success of Phase I, the solar industry witnessed a great momentum wherein grid connected, and off-grid projects were commissioned throughout the country. Phase II thus aimed at achieving higher targets. Several schemes like bundling, Viability Gap Funding (VGF) schemes for defence establishments, etc. **Phase 3(2017-2022):** By the end of phase 3 the targets that are to be achieved are: 1. Utility Scale Solar including rooftop=20,000 MW 2. Off-grid Solar applications=2000MW **3.** Solar Collectors=20 million sq. meters
Maldives	• Maldives Energy Policy & Strategy, 2016	Aims to strengthen the institutional and regulatory framework of the energy sector, promote energy conservation and efficiency, increase the share of renewable energy in the national energy mix, improve the reliability and sustainability of electricity and maintain universal access to electricity, increase national energy security.
Nepal	• National Rural Renewable Energy Programme (NRREP	This policy provides a framework for the local communities across the country to have access to not only energy but also energy efficient technologies through various subsidy programs. By 2020, Nepal intends to expand its energy mix focusing on renewable by 20% and diversifying its energy consumption pattern to more industrial and commercial sectors.
Pakistan	• Policy for Development of Renewable Energy for Power Generation, 2006	The policy comprises of three phases: short, medium and long term. The short-term policy, which covers the period up to June 2008, lays down very liberal and attractive incentives to attract investment to put Pakistan on the renewable energy map of the world. Based on the experience gained under the short term, the policy for the next phases will be consolidated and elements of competition will be introduced.
Sri Lanka	• Long Term Generation Expansion Plan 2018-2037	The policy includes information on the existing generation system, generation planning methodology, system demand forecast and investment and implementation plan for the proposed projects, recommends the adoption of the least cost plant sequence derived for the base case and emphasizes the need to implement the plan to avoid energy shortfalls.

2.4.3. The Future Outlook

Each SAARC country has a renewable energy target to which all the renewable energy programs are aligned. These targets are ambitious and are being regularly tracked by the countries and other international bodies like World Bank.

Table 9: Country Level Targets

Country	Target (By year)	Target (By Technology)
Afghanistan[22]	• By 2032: 10% of total energy mix to be from renewable energy • (350-450 MW of Renewable Energy)	-
Bhutan[23]	• By 2020: additional 10,000 MW of hydropower capacity;100% organic • By 2030: zero waste	• Solar: 5 MW by 2025 • Wind: 5 MW by 2025 • Bio- Mass: 5 MW 2025
Bangladesh[24]	• By 2020: 10% energy mix through renewable energy • By 2021: Access to electricity for all	-
India[25]	• By 2022: 175 GW of renewable energy	• Solar: 100 GW by 2022 • Wind: 60 GW by 2022 • Bio- Mass: 10 GW 2022 • Small Hydro: 5 GW by 2022
Maldives[26]	-	• Wind – 20 MW by 2020 • Solar plant – 20 MW by 2020
Nepal[27]	• By 2050, Nepal will achieve 80% electrification through renewable energy sources	• Mini & Micro Hydropower – 25 MW by 2020 • Solar Home system – 600,000 systems by 2020 • Solar PV and pumps systems – 1,500 systems by 2020 • Biogas – 130,000 household system, 1000 institutional and 200 community biogas plants by 2020
Pakistan[28]	• The Pakistani government plans to invest a further **USD 500 million** in renewable energy projects in the country by 2030	
Sri Lanka[29]	• Generate 100% electricity through renewable energy	• Large hydro – 1,576 MW Biomass - 394MW • Small Hydro – 753 MW Solar- 16,438MW • Wind – 15,155 MW

[22] (Afghan Energy Information Center, n.d.) (Islamic Republic of Afghanistan Ministry of Energy & Water Renewable Energy Department, n.d.)
[23] (Unchronicle, n.d.)
[24] (Sustainable Energy for All , n.d.)
[25] (Renewable Energy India Expo, n.d.)
[26] (International Finance Corporation, n.d.)
[27] (Nepal Energy Assessment Road Map)
[28] (Global Climatescope, n.d.)
[29] (Assessment of Sri Lanka's power sector by ADP and UNDP)

Afghanistan: The country has plans to increase the deployment of renewable energy technologies to meet the targets of PSMP i.e. 10% of total energy mix of 3500MW to 4500MW in 2032 through grid connected, mini grids and standalone projects. Term 1 will deploy 100MW (50MW is already installed) and Term 2 will achieve 250MW to 350MW. The government of Afghanistan has planned renewable energy projects of total capacity 500MW worth USD 1075 million. The projects include generation of electricity from Solar, Wind, Solar rooftop, Solar-hydro and solar wind. The expected commencement of work for these projects are 2017/2018.

Bangladesh: As access to energy is the key ingredient to alleviate poverty and to improve the socioeconomic condition of the people of Bangladesh. The vision of the government is to make electricity available for all by 2021. Renewable energy will play a vital role in achieving the demand of electricity especially in off-grid areas of the country. The government has plans to generate 10% of the total electricity by 2020. As a part Power system master plan (PSMP) which was drawn in 2010, the goal is to achieve a target of 40,000 MW via conventional and non-conventional plants. The government has plans to replace 18,700 diesel-based irrigation pumps with solar pumps. Under this programme, 150MW of electricity will be generated.

Bhutan: The country has plans to add an additional 10,000 MW of hydropower capacity by 2020, which will be primarily for exports as well as the additional power will cater to the domestic demand for electricity in winter season when the generation from hydropower plants drops to 80% due to reduced flow in rivers. Bhutan also targets to generate 20 MW of renewable energy by 2025, with 5 MW capacity each from the electricity generated by solar, wind, biomass and biomass & solar thermal systems. The government targets to electrify 3582 households, in the remote areas, which will not be connected to the electric grid.

India: By 2022, India is targeting the installation of 175GW of renewable energy capacity, an ambitious target that will require a four-fold growth in the sector. The country has installed capacity over 50GW of renewable capacity as of December 2016, 57% of which is wind. The 2022 target includes 60GW of large and medium-scale grid-connected solar power projects, 60GW of wind, 40GW of solar rooftop projects, 10GW of bio-power and 5GW of small hydro. As a result, renewable energy in India is viewed as a more fervent investment, capacity-building activity and has a steeper fall in per unit energy supply tariff than any other energy source in the country.

Maldives: The Maldives aims to be a low- carbon economy. The country plans to add up 20MW of solar capacity by 2020 while contributing to its target of 100% renewable energy by 2050. Led by the World Bank, the ASPIRE project is a five-year initiative designed to promote

additional private sector investments of between USD 40 million and USD 70 million in solar projects. By the end of 2018, the government has set a target to provide all the energy via renewable energy sources to every inhabited island.

Nepal: By 2022, the country looks forward to self-sufficiency in power requirements. According to Nepal Electricity Authority (NEA). Nepal will achieve 80% electrification through renewable energy by 2050 and it will help the country to reduce its dependency on fossil fuels by 50%. Under the Nepal rural renewable energy program, the country aims to achieve the target of 25MW electricity generation via mini and micro hydro projects, 600,000 solar home system, 130,000 biogas household systems with 1,000 institutional & 200 community biogas plants.

Pakistan: Pakistan's Alternative and Renewable Energy policy aims to increase renewable energy to 5% of total commercial energy by 2030. There will 34 energy projects which are planned under the China Pakistan Economic Corridor (CPEC) and proceeding as per the CPEC targets, according to the AEDB. 200 MW of wind projects and 900 MW of solar projects are currently under development under the CPEC. The country has 1.1GW of wind power plant, 557MW of solar PV and 578MW of biomass power plants at different stages of development. In 2006, the ministry had set a minimum target of 9,700MW of renewable energy projects by 2030 as per the Medium-Term Development Framework

Sri Lanka: In pursuance of increased renewable energy adoption Sri Lanka pledged to use only renewable energy for electricity generation by 2050. It will constitute a big leap towards achieving climate sustainability for the country. The country is establishing large wind power farms (514 MW) replacing planned thermal power plants generating equivalent amount of electricity. Sri Lanka plans to setup solar power plants of capacity up to 115 MW. It is promoting use of biomass and waste by elevating its use in power generation, adding 104 MW by 2025. Apart from this, the government is also promoting mini and micro-hydropower generation projects with a targeted capacity of 176 MW. The estimated capital requirement for project development would be USD 35 38 billion.

2.5. Barriers hindering growth of Renewable Energy with greater emphasis on financing

All larger RET projects will generally require access to long-term funding on a project finance basis, their exposure to other barriers and risks will differ. Project sizes—and therefore transaction cost barriers—are generally lower for wind and geothermal projects that can be developed on a greater scale than other technologies. While geothermal and small hydro can be competitive with conventional technologies and wind energy is approaching

competitiveness in some countries, solar technologies remain a long way from achieving cost competitiveness, and so affordability remains a key risk. The risks and barriers facing off-grid projects also differ from those of on-grid RET projects. These projects are generally reliant on sales of individual household or small-scale systems to rural communities. While technical challenges may be limited, affordability and financing ability become key. The very small scale of such projects, down to the individual household level, means transaction costs can become an almost insurmountable barrier. The project risks mapped to different technologies is mentioned below:

Table 10: Mapping of Project Risks with Different Renewable Energy Technology[30]

		ON-GRID					Off- GRID	
		Wind	Solar	Small Hydro	Biomass	Geothermal		Solar/Micro - Hydro
Small scale of projects		Low	Med	Med	Med	Low		Hi
High financial cost		Med	Hi	Low	Med	Low		Med
High exposure to Regulatory risk		Med	Med	Med	Med	Med		Low
Uncertainties over carbon financing		Med	Med	Low	Med	Low		Low
High costs of resource assessments		Low	Low	Med	Low	Hi		Low
Uncertainties over resource adequacy		Med	Med	Hi	Hi	Med		Med

Note: **Low** – Small or no impact (mitigation of risks is desirable); **Med**- moderate impact (mitigation of risks is likely to be required); **Hi**- significant impact (mitigation risks is required)

Table 11: Risks faced by Investors in Renewable Energy Projects[31]

Barrier	Brief description
Financing	
Foreign exchange risk	• Currency risk due to uncertain currency movements and high cost involved with market-based currency-hedging solutions.

[30] (World Bank- Financing renewable energy Options for Developing Financing Instruments Using Public Funds)
[31] (Instruments to Mitigate Financial Risk in Indian Renewable Energy Investments , 2017)

Barrier	Brief description
Off taker credit risk	• The risk that the buyer/off-taker will not fulfill its contractual obligations. It is a key contributor to the overall credit risk of a power project.
Quality of renewable energy Projects	• The credit rating of the operational renewable energy assets may be low overall, leading to operational assets not meeting investment criteria.
Lack of instruments for investment	• Lack of financial instruments (or pathways) – illiquid or liquid – to invest in renewable energy.
Low returns compared to expectations	• Renewable energy projects not being able to meet the risk-return expectations of investors.
Limited availability of debt capital	• Limited availability of debt capital due to capital market conditions, either domestically or internationally.
Completion	
Construction risk	• Risks related to increase in overall financing cost due to construction related issues – esp. due to delays in construction due to permitting.
Land acquisition issues	• Issues faced in land acquisition, esp. if there is no single window clearance in place, or if the time taken to obtain clearances is high.
Transmission evacuation[2]	• The lack of availability of transmission evacuation infrastructure, and time taken to get the clearances and permitting.
Operational	
Curtailment issues	• Wind developers may face this issue during high wind seasons when higher than expected generation creates oversupply situations as well as congestion.
Contract enforceability risk	• Drastic reduction in cost of solar power generation may result in poor contract enforceability in the long-term.
Others	
Lack of trusted intermediaries	• Lack of trusted financial intermediaries may result in new and/or smaller investors staying away from the sector.
Limited understanding of sector	• Many investors are not aware of renewable energy sector and, therefore, prefer to make investments in mainstream asset classes.
Regulatory/policy risk	• The risks related to uncertainty in availability of incentive schemes, poor implementation of policies and non-uniform policies across states.
Net metering policies	• The net metering policies across states may lack coherency as well as poor implementation.

2.6. Opportunities in the Sector

Energy and the environment have a close relationship. A regional thrust to clean energy development in SAARC has helped enhance the use of more hydro and renewable energy resources, thus reducing the adverse environmental impact of fossil fuels use and giving an alternative for the countries to meet growing energy needs. In the global context, this means an ultimate reduction in greenhouse gas emissions and mitigating the impacts of climate change. While in Afghanistan, Maldives and Sri Lanka there is maximum potential to develop solar power, Nepal and Bhutan are endowed with rich hydro resources. India, Pakistan and Bangladesh being larger countries can aim for a more balanced renewable energy mix of solar, wind and hydro.

Table 12: Renewable Energy Potential[32]

Country	Solar Power Potential (MW)	Hydro Power Potential (MW)	Wind Power Potential (MW)
Afghanistan	200,000(6.5 kWh/day/$m^{2)}$	25,000	158000
Bangladesh	5.0 kWh/day/m^2		
Bhutan	1200 (4-5.5 kWh/day/$m^{2)}$	28,000	761
India	5.0 kWh/day/m^2	150,000	102778
Maldives	5.0 kWh/day/m^2	-	0.08 kW/m^2 to 0.16 kW/m^2
Nepal	4.66 kWh/day/m^2	45,000	3.387 MWh/m^2
Pakistan	2,900,000	59,000	131,800
Sri Lanka	5 kWh/day/m^2	2,000	24000

[32] (Science Direct , n.d.) (Innovatorsmag, n.d.) (Wind Arch , n.d.) (Semantics Scholar, n.d.)

3. Support for Market Development

Since all SAARC countries are emerging economies, the emphasis has traditionally been on encouraging the lowest cost of energy generation. Hence renewable energy (solar and wind) was not the first choice for several countries considering the perceived high cost of renewable energy vis a vis traditional sources such as thermal power. However, over the past couple of years, considering the technological advances and the increased scale of renewable energy installations worldwide, renewable energy has now become very competitive and in some countries has also reached cost parity with thermal.

Renewable energy has several qualitative benefits which are of great importance because countries all over the world are becoming more focused towards environment and reducing carbon footprint. In order to provide energy in the most remote areas, which is a challenge in SAARC nations, renewable energy comes out as the most viable option with readily available fuel such as the sun, wind or biomass and use of small-scale projects and off-grid installations to reach these areas.

3.1. Economics of Renewable Energy

- When we do a levelized cost of electricity (LCOE) comparison of solar, wind, biomass with coal we come across certain fundamental differences. The major drivers of LCOE for renewables are initial capital expenditure, capacity utilization factor, interest rate and return on equity, the fuel costs are almost nil in renewable energy projects whereas for thermal projects capital expenditure and fuel cost are major drivers of LCOE.
- It is extremely important to highlight the higher sensitivity of certain drivers on the LCOE in case of renewables such as initial capital cost and hence return on equity and interest cost whereas in case of thermal it is the fuel costs.

3.1.1. Solar

Sun is the fundamental source of all forms of energy on earth. The global solar resource is massive. Around 885 million TWh worth of solar radiation reaches the Earth's surface each year. Thus, solar energy has vast potential to be harnessed as it is clean, readily available and free of cost.

Technologies

There are two primary technologies by which solar energy is commonly harnessed on a utility scale: photovoltaics (PV), which directly convert light to electricity and concentrating solar

power (CSP), which uses heat from the sun (thermal energy) to drive electric turbines. On a residential scale: rooftop photovoltaics, solar cookers, solar water heaters, solar pumps and other such solar powered devices are used.

Solar Photovoltaics

Photovoltaic (PV) devices generate electricity directly from sunlight via an electronic process that occurs naturally in certain types of material, called semiconductors. Electrons in these materials are freed by solar energy and can be induced to travel through an electrical circuit, powering electrical devices or sending electricity to the grid. PV devices can be used to power anything from small electronics such as calculators and road signs up to homes and large commercial businesses. Most modern solar cells are made from either crystalline silicon or thin-film semiconductor material. Silicon cells are more efficient at converting sunlight to electricity, but generally have higher manufacturing costs. Thin-film materials typically have lower efficiencies but can be simpler and less costly to manufacture. A specialized category of solar cells - called multi-junction or tandem cells - are used in applications requiring very low weight and very high efficiencies, such as satellites and military applications. All types of PV systems are widely used today in a variety of applications.

Concentrating Solar Power

Concentrating solar power (CSP) is a power generation technology that uses mirrors or lenses to concentrate the sun's rays and, in most of today's CSP systems, to heat a fluid and produce steam. The steam drives a turbine and generates power in the same way as conventional power plants. CSP plants can be broken down into two groups, based on whether the solar collectors concentrate the sun rays along a focal line or on a single focal point (with much higher concentration factors). Line-focusing systems include parabolic trough and linear Fresnel plants and have single-axis tracking systems. Point-focusing systems include solar dish systems and solar power plants and include two-axis tracking systems to concentrate the power of the sun.

Economics

Module Costs

Module costs declined 80% from 2010 to 2016. In 2017, module prices have dipped as low as USD 0.3/W making installing solar panels extremely affordable. These low costs have been driven mainly by substantial capacity and deployment upsurge, their associated economies of scale and improvements in the production process and cell design.

Installed Costs

Between 2010 and 2017, the global capacity weighted average total installed cost of utility scale PV projects decreased by 68%. Significant installed costs reduction can be achieved by

formulating policies that reduce administrative hurdles associated with gaining permits or incentives, or those that slow connection application processes.

Capacity Factors

The global weighted average capacity factor of utility scale PV systems increased by 28% between 2010 and 2017. This has been driven by two major factors, the trend towards greater deployment in regions with higher irradiation levels and the increased focus on improving system performance and reducing losses.

Operation & Maintenance Costs

Historically, solar PVs O&M costs have not been considered a major challenge to their economics. Yet, with the rapid fall in solar PV module and installed costs over the last five years, the share of O&M costs has climbed successfully. Land lease costs are very site and market specific. They can be extremely low where land values are minimal like in deserts or uninhabited areas and very high in densely populated regions. Policies charging zero land fees as an incentive to the project developer are a huge encouragement as they significantly reduce O&M costs.

Levelized Cost of Electricity

Rapid declines in installed costs and increased capacity factors have improved the economic competitiveness of solar PV around the world. The global weighted average LCOE of utility-scale

PV plants is estimated to have fallen by 73% between 2010 and 2017, from around USD 0.36 to USD 0.10/kWh.

Table 13: Solar LOCE data for India and China for the Year 2017[33]

India	China	South Asia
USD 0.0886/kWh	USD 0.0843/kWh	USD 0.0865/kWh

3.1.2. Wind

Technology

The modern era of wind power began in 1979 with the mass production of wind turbines by Danish manufacturers. These early wind turbines typically had small capacities (10 kW to 30 kW) by today's standards, the current average size of grid-connected wind turbines is around 1.16 MW, while most new projects use wind turbines between 2 MW and 3 MW. When wind turbines are grouped together, they are referred to as "wind farms". Wind farms comprise the

[33] (IRENA Renewable Power Generation Costs , 2017)

turbines themselves, plus roads for site access, buildings (if any) and the grid connection point. Wind power technologies come in a variety of sizes and styles and can generally be categorized by whether they are horizontal axis or vertical axis wind turbines, and by whether they are located onshore or offshore. The power generation of wind turbines is determined by the capacity of the turbine, the wind speed, and the height of the turbine and the diameter of the rotors and the quality of O&M strategy.

Wind turbines typically start generating electricity at a wind speed of 3-5 m/s, reach maximum power at 11-12 m/s and generally cut out at a wind speed of around 25 m/s.

Economics

Wind Turbine Costs

Wind turbine prices fluctuate with demand and supply, as well as with economic cycles. The latter can affect the cost of the materials used in wind turbine manufacturing, as these have significant exposure to commodity prices like those of copper, iron, steel and cement. Depending on the market and technology segment, wind turbines prices peaked between 2007 and 2010 because of greater demand than supply, before starting to decline. In 2017, the average wind turbine prices in most if not all markets stand below USD 1000/kW.

Total Installed Costs Onshore

Depending on the country, the start date for first commercial deployment varies greatly. Cost ranges represent the natural variation of renewable power projects, given the site-specific characteristics that can influence total installed costs. These characteristics include items such as the level of existing infrastructure to enable access to sites, the distance from ports or manufacturing hubs, the distance from a major grid-interconnection point, labour costs and many others. The lowest installed costs for onshore wind projects are to be found in China and India, with weighted average total installed costs estimated to be USD 1245/kW and USD 1121/kW in 2016 which translates into a decline of 11% and 16% respectively from 2010.

Total Installed Costs Offshore

In comparison to onshore wind projects, offshore wind farms have significantly higher lead times. Planning for offshore wind farms is more complex and construction even more so, increasing total installed costs. Given their offshore location, they also have higher grid connection and construction costs. O&M costs are higher for offshore wind than for onshore wind, because of the complexity of servicing offshore wind turbines and the more challenging environment at sea. Between 2010 and 2016, global weighted average installed costs increased by 4%, up from USD 4430/kW to USD 4487/kW.

Operation & Maintenance Costs

The global wind power O&M market is expected to grow from USD 12 billion 2016 to more than USD 27 billion by 2026. O&M costs, both fixed and variable, are a significant part of the LCOE of wind power. Original equipment manufacturers have the largest share of the routine turbine O&M market in 2016, with around 70%. In China, the costs range from USD 0.008/kWh to USD 0.028/ kWh. In India, the costs range from USD 0.005/kWh to USD 0.027/kWh.

Levelized Cost of Electricity

The LCOE depends largely on four factors:

- Capacity factor: This is the result of an interplay of several variables, among which the most important is the nature and quality of the wind resource, followed by wind turbine design and operational availability.
- Total installed costs: The turbine cost is usually the single largest cost item in a wind project, though depending on the complexity of the project, its share can be less important. This is even more so for offshore wind projects.
- WACC: The cost of debt, the equity premium of the investors, and the share of debt and equity in a project all go towards the final value of the WACC.
- Operations and maintenance costs: Operational expenses consist of both fixed and variable costs and can represent up to 20%-25% of LCOE.

The data suggests that every time cumulative installed capacity doubles, the LCOE of onshore wind drops by 15%.

Table 14: Wind LCOE data for India and China in 2016[34]

India	China	South Asia
USD 0.0653/kWh	USD 0.0569/kWh	USD 0.0611/kWh

3.1.3. Biomass

Technologies

Power generation from bioenergy can come from a wide range of feedstock and use a variety of different combustion technologies. Bioenergy power generation technologies range from commercially proven solutions, with a wide range of suppliers, through to those that are only just being deployed on a commercial scale. The power generation technologies that are mature, commercially available and have a long track record include: direct combustion in stoker

[34] (IRENA Renewable Power Generation Costs , 2017)

boilers; low-percentage co-firing; anaerobic digestion; municipal solid waste incineration; landfill gas and combined heat and power. Other less mature technologies, such as atmospheric biomass gasification and pyrolysis, are only at the beginning of their deployment. The potential for cost reductions from the technologies in use is therefore very heterogeneous. While only marginal cost reductions can be anticipated in the short term, there is good, long-term potential for cost reductions from those technologies that are not yet widely deployed. To analyze the use of biomass power generation, the following three components must be examined:

- Biomass feedstock: These come in a variety of forms and have different properties that impact their use in power generation.
- Biomass conversion: This is the process by which biomass feedstock are transformed into the energy form that will be used to generate heat and/or electricity.
- Power generation technologies: A wide range of commercially proven power generation technologies are available that can use biomass as a fuel input, but technology risks remain for some of the newer, more innovative technologies.

Economics

Installed Cost Trends

Technology options largely determine the cost and efficiency of biomass power generation equipment, although equipment costs for individual technologies can vary significantly. Factors affecting this depend on the region, feedstock type and availability, and how much feedstock preparation or conversion happens on site. Planning, engineering and construction costs, fuel handling and preparation machinery, and other equipment (e.g. the prime mover and fuel conversion system) represent the major categories of total investment costs of a biomass power plant. Additional costs are derived from grid connection and infrastructure (e.g. roads). Combined heat and power biomass installations have higher capital costs, but the higher overall efficiency (around 80%-85%) and the ability to produce heat and/or steam for industrial processes, or for space and water heating through district heating networks, can significantly improve the economics. Biomass power plants in emerging economies can have significantly lower investment costs than the cost ranges for OECD-based projects, due to lower local content costs and the cheaper equipment allowed, in some cases, by less stringent environmental regulations. Biomass installed costs in India are the lowest, ranging from USD 450 to USD 2 600/kW, while in China they range from USD 450 USD 3 600/kW.

Operation & Maintenance Costs

Fixed operations and maintenance (O&M) costs for bioenergy power plants typically range from 2-6% of total installed costs per year, while variable O&M costs are typically relatively low, at around 0.005/KWh. Fixed O&M costs include labour, scheduled maintenance, routine

component/equipment replacement (for boilers, gasifiers, feedstock handling equipment, etc.), insurance, etc. The fixed O&M costs of larger plants are lower per kW due to economies of scale, especially for labour. Variable O&M costs are determined by the output of the system and are usually expressed as USD/kWh. Non-biomass fuel costs, such as ash disposal, unplanned maintenance, equipment replacement and incremental serving costs are the main components of variable O&M costs.

Levelised Cost of Electricity

The wide range of bioenergy-fired power generation technologies and feedstock costs translates into a broad range of observed LCOEs for bioenergy-fired electricity. Assuming a cost of capital of 7.5%-10% and feedstock costs between USD 1/GJ and USD 9/GJ (the LCOE calculations in this report are based on an average of USD 1.5/GJ), the weighted average LCOE of biomass-fired electricity generation is around USD 0.05/kWh in India and USD 0.06/kWh in China.

3.1.4. Hydro Power

Technology

Hydropower is a mature and reliable technology that still dominates total renewable electricity generation, although its share of global renewable capacity has been slowly declining. In 2010, it accounted for around 75% of this total, but by 2016, its share was approximately 50%. In terms of electricity production, hydropower accounted for 81% of electricity from renewable sources, but by 2016, its share had dropped to 70%. Hydropower is an extremely attractive renewable technology due to the low-cost of the electricity it produces, it can also provide other grid services such as frequency or voltage regulation, fast reserve, etc. Its ability to meet load fluctuations minute by minute and operate efficiently at partial loads, which is not the case for many thermal plants, makes it a valuable part of any electricity system. Hydropower plants can be constructed in a variety of sizes and with different properties. There are a range of technical characteristics that affect the choices of turbine type and size, as well as the generation profile. These include the height of the water drop to the turbine – known as the “head” – seasonal inflows, potential reservoir size, minimum downstream flow rates, and many other factors. An important opportunity offered by hydropower is the possibility to add capacity at existing schemes or install capacity at dams that do not yet have a hydropower plant.

Economics

Installed Cost Trends

There are two major costs components for hydropower projects:

- The civil works for the hydropower plant construction, including any infrastructure development required to access the site and the project development costs.
- The costs related to electro-mechanical equipment.

Although electro-mechanical equipment costs usually contribute less to the total cost in largescale projects, the opposite is true of small-scale projects (with installed capacity of less than 10 MW).

For small-scale projects, the electro-mechanical equipment costs can represent 50% or more of the total costs, due to the higher specific costs per kW of small-scale equipment.

The capital costs of large hydropower projects are dominated by the civil works and equipment costs, which can represent between 75% and as much 90% of the total investment costs. Civil works costs are influenced by numerous factors pertaining to the site, the scale of development and the technological solution that is most economic. Hydropower is a highly site-specific technology, with each project designed for a location within a given river basin. In most surveyed regions, it is observed that small hydro plants have higher installed costs compared to large hydro plants.

Table 15: Hydropower Installed Cost Data for India and China in 2016[35]

	India	China	South Asia
Small	USD 1624/kW	USD 1070/kW	USD 1347/kW
Large	USD 1383/kW	USD 1098/kW	USD 1240/kW

Operation & Maintenance Costs

Annual O&M costs are often quoted as a percentage of the investment cost per kW per year. Typical values range from 1-4%. The International Energy Agency assumes 2.2% for large hydropower projects and 2.2-3% for smaller projects, with a global average around 2.5%.This would put large-scale hydropower plants in a similar range of costs as a percentage of total installed costs as those for wind, although not as low as the O&M costs for solar PV.

Levelised Cost of Electricity

Hydropower projects can be designed to perform very differently from each other, however, which complicates a simple LCOE assessment. A plant with a low installed capacity could run continuously to ensure high average capacity factors, but at the expense of being able to ramp up production to meet peak demand loads. Alternatively, a plant with a high installed electrical capacity and low capacity factor would be designed to help meet peak demands and provide

[35] (IRENA Renewable Power Generation Costs , 2017)

spinning reserve.

Table 16: Hydropower LCOE data for India and China in 2016[36]

	India	China	South Asia
Small	USD 0.056/kWh	USD 0.039/kWh	USD 0.048/kWh
Large	USD 0.046/kWh	USD 0.037/kWh	USD 0.042/kWh

3.2. The Need for External Finance

In order to meet the aggressive renewable energy targets, set by the countries, there is a clear need to accelerate investments and expand finance access significantly in the sector to bridge the currently prevailing financing gap. Reaching the investment goal requires targeted efforts focusing on improving project readiness, facilitating access to finance at the local level and introducing risk mitigation measures. To this end, various stakeholders need to be engaged, including governments, national financing vehicles, development finance institutions and the private sector.

3.3. Role of private sector in development and promotion of Renewable Energy

3.3.1. Key challenges

Some of the challenges faced by the private sector in accessing finance and attracting capital into renewables include unfavourable scale of project, lack of long-term and project financing, weak or underdeveloped local financial markets constraining re-finance or exit from the project, general knowledge, resource adequacy and capacity gaps among the project stakeholders and investment risks.

Sometimes, the scale of investments may be small while transaction costs can be substantial which prohibits larger investors/financial institutions from considering such projects. For example, in biogas plants there are challenges in raising long-term finance since its requirements are too small for most local banks' project finance teams, and too unconventional for the banks' small and medium enterprise financing teams. Some of the other issues faced by the private sector are given below -

- In terms of the availability of capital, a fundamental problem is the lack of equity funding coming from the private sector for energy and infrastructure projects. In countries like India, the private sector has accounted for approximately 30% of the

[36] (IRENA Renewable Power Generation Costs , 2017)

annual total investment in infrastructure over recent years, whereas in Viet Nam, for example, the private sector has shouldered less than 10%, an insufficient share.[37]

- In countries where there is a lack of access to bank debt in general, the cost of debt finance and the limited length of loan tenure can be acute problems.
- Some of the markets also lack investment and financial vehicles to mitigate risks. Currency inconvertibility risk is often a barrier to attracting investment from foreign investors when the PPAs are denominated in local currency and banks are reluctant to carry exchange risks or provide competitively priced hedging.
- Power off-taker risk (a specific type of counterparty risk) is another key risk that needs to be addressed. It includes backing down of renewable energy generation and delay in payment realization. While various risk mitigation instruments are available and often provided by international and development finance institutions (IFIs and DFIs), many local developers do not have the necessary knowledge and skills to deal with the complex requirements of the IFIs and DFIs in the absence of intermediaries. Many a times there is very little the private investor can do, and such issues must be taken care of by the central or state government.
- The maturity and development level of financial institutions vary between countries and between regions within the same country. While some of the larger financial institutions are knowledgeable and well versed with project financing and transactions related to renewable energy, local banks and project sponsors in some countries or regions often do not have such capacity, awareness and know how. Traditionally, they have been more familiar with conventional technologies and lack confidence in investing in renewable energy projects. Currently domestic banks are supplying only a small proportion of local capital for renewable energy. From the commercial banks' point of view, limited local benchmark and reference projects also reduce their ability to invest.
- Another barrier is a knowledge gap in the capacity of provincial and local government entities, particularly municipalities, to assess the appropriate technology, prepare projects and arrange financing for them. As a result, there are many instances of poorly designed and poorly performing projects.
- Although PPPs could help in project structuring, many local governments lack the capacity to allocate legal, political, commercial and financial risks between public and private parties and secure stable long-term revenue streams.
- Many a times, renewable energy projects are small in scale and incur relatively larger transaction and due diligence costs. Pooling several such small-scale projects is a

[37] (IRENA- Renewable Energy Market Analysis Southeast Asia)

solution to this problem. In the absence of pooled renewable energy assets and scale, it may take some time for the region to start issuing green bonds as actively as in other developed markets.

The financial risks mapped to different technologies is mentioned below:

Table 17: Mapping of Financial Risks with Different Renewable Energy Technology

		Wind	Solar	Small Hydro	Biomass	Geothermal		Solar/Micro Hydro
Lack of Long-term Financing	ON-GRID	Hi	Hi	Hi	Hi	Med	OFF-GRID	Med
Lack of project Financing		Med	Med	Med	Med	Med		Low
High and uncertain project development costs		Low	Low	Med	Low	Hi		Med
lack of equity finance		Low	Med	Med	Low	Med		Hi

Note: **Low** – Small or no impact (mitigation of risks is desirable); **Med**- moderate impact (mitigation of risks is likely to be required); **Hi**- significant impact (mitigation risks is required)

4. Financial Instruments

4.1. Overview

A variety of public or private financing instruments is available to support RE projects. Over the years, various kinds of innovative financial instruments and structures have been deployed. These innovative instruments have proved to be a successful mode of investment into matured markets. The selection of instruments varies from projects to projects depending on the type of risks faced by the investors. Most of the renewable energy financing instruments falls under three categories:

a. Equity Finance Mechanisms (Infra Funds, Pension Funds, VC, PE, Capital/Project Grants, Contingent Grants)

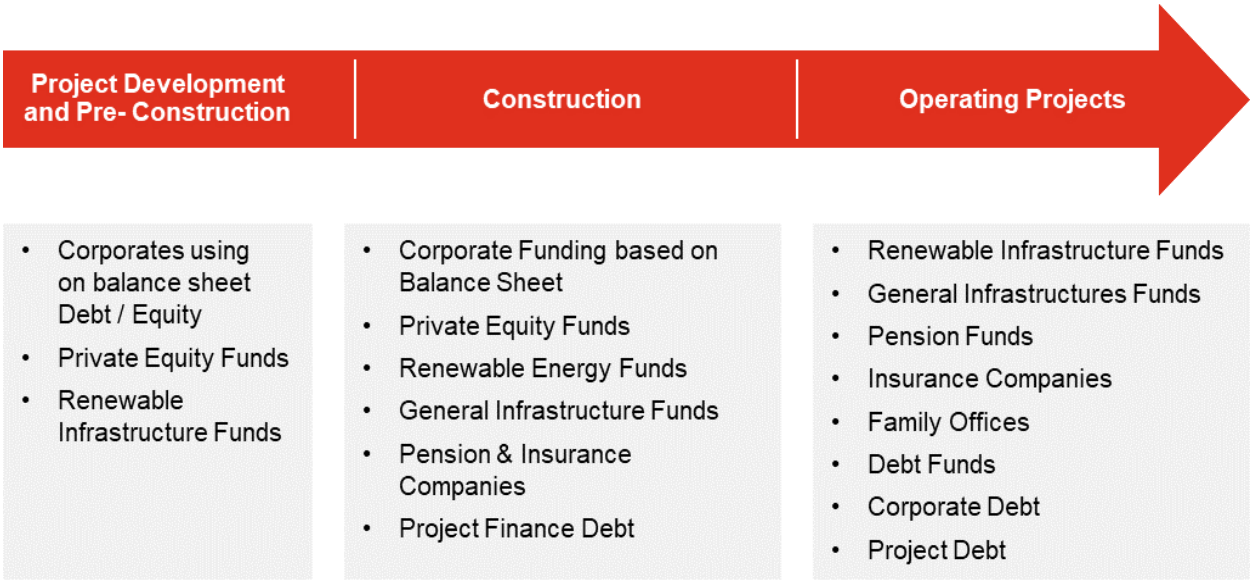
b. Debt Finance Mechanisms (Senior Debt, Mezzanine Debt, Guarantees);

c. Energy Market instruments (Feed-in Tariffs, Renewable obligations, Fiscal incentives)

Renewable Energy Project stages and Stage Wise Funding

A summary of renewable investment profile against the different phase of projects has been described below

Figure 8: Renewable Energy Project Stages and Stage Wise Funding



4.2. Long Term Equity

Renewable energy equity investors take an ownership stake in a project, or company. It involves a range of financial investors including Private Equity Funds, Infrastructure Funds and Pension Funds. The funds are infused into companies or directly into projects. Different types of equity

investors engage, depending on the type of business, the development phase renewable energy technology, and degree of risk. For example, Venture Capital generally focus on early stage of technology companies, Private Equity firm tends to invest in technology which are in the matured phase and exit their investments in 3-5 years, Infrastructure investment are interested to invest in low risk infra projects like road, grid, and rail construction. Pension funds invest large amount of money for a long period at a minimum risk. The table mentioned below briefs about the key features of fund providing equity.

Table 18: Key features of Fund Providing Equity

Key features of Fund providing Equity[38]				
	Venture Capital Funds	**Private Equity Funds**	**Infrastructure Funds**	**Pension Funds**
How funds are raised	Funds are raised from wide range of sources with high- risk appetite to include insurance companies, pension funds, mutual funds and High net worth individuals	Funds raised from a wide range of sources with medium risk appetite to include institutional investors and high net worth individuals	Funds drawn from a range of institutional investors and pension funds	Funds are drawn via Public equity, corporate & Government bonds real estate, private equity, cash and inflated linked assets
Appetite for Risks	High	Medium	Low	Low
Loan Tenor	4-7 years	3-5 years	7-10 years	8 - 12 years
Expected IRR	50 % to 500%	25%	15%	15%
Area of Investment	New Technology	Matured Stage	Mature Stage	Mature Stage
Investors	Renewable energy venture fund (ARENA & Softbank) Sunnova Energy Corp, SunRun, Hampton Creek	Africa Renewable Energy Fund, IDFC, Abu Dhabi Investment Authority, Goldman Sachs.	Allianz Global Investors, Blackrocks, GEEREF	

Specialized equity funds are created to invest in commercially and sustainable energy companies providing equity investment capital. Some of these companies are also sponsored by the multilateral organizations (IFC or GEF). The Dutch Triodos Bank is a social lending bank that lends only to organisations and businesses, which have both social and environmental objectives. Triodos Renewable Energy for Development Fund provides finance to promote and

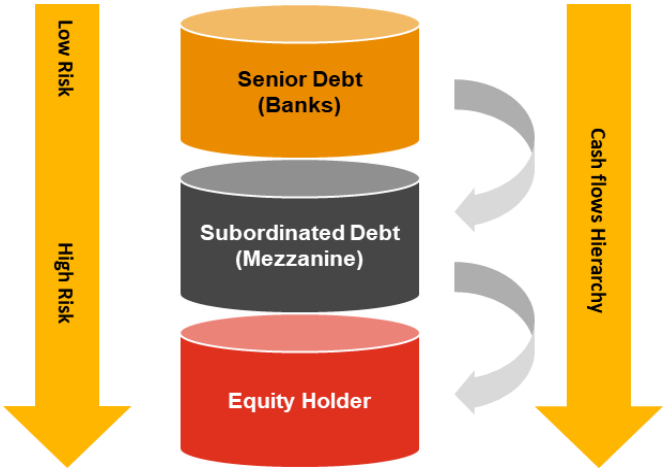
[38] (Private financing of renewable energy - BNEF , 2009)

to support the accessibility and use of renewable energy services in the developing countries. The fund offers finance for importers, wholesalers, energy services companies and retail chains for expansion of working capital or for investments. Investment amounts may vary from Euro 100,000 – Euro 250,000. For project developers such funds act as a seed capital.

4.3. Debt Funding

Debt is a very important aspect of capital for renewable energy projects. Debt funding, through conventional term loans, covers ~70% of project costs. The lenders who provide debt financing to a project do not hold shares in the project or company. The major sources of debt financing are international and national commercial banks. Other sources of debt financing include multilateral development banks (MDBs) and the International Finance Corporation (IFC), debt/equity investment funds, equipment suppliers, and private investors. In debt funding, the lenders must be paid before the shareholders are repaid. Hence, the lenders bear less risk than equity holders. To get a better view of cash flows, a systematic flow cash flow waterfall is mentioned below:

Figure 9: Cash flow from Senior Debt to Equity Holders



4.3.1. Sources of debt funding renewable energy projects are mentioned below:

International financial institutions

These institutions are both global and regional multilateral development banks in nature that provide funds, financing instruments and risk mitigation instruments. Such institutions raise capital from governments across different countries. Sometimes these institutions also act on behalf of multiple government donors. Some of the renowned institutions who are active in funding RE project are the World Bank Group, the Asian Development Bank (ADB), the European Investment Bank (EIB), the European Bank for Reconstruction and Development

(EBRD), the African Development Bank (AfDB), the Islamic Development Bank, the Inter-American Development Bank, the Asian Infrastructure Investment Bank and the New Development Bank.

Development Finance Institutions (DFIs)

DFIs include most of the international financial institutions, which are mentioned above. It also includes bilateral development agencies, such as the AFD (the French Development Agency), KfW (the German Development Bank) and JICA (the Japanese International Cooperation Agency). DFIs provide bilateral finance from developed country to other developing countries. DFIs also include national development banks and government funding agencies that provide finance within their own individual countries, such as BNDES, the Brazilian Development Bank.

Local financial institutions

It refers to both public and private finance institutions with a main presence in the domestic market. They could be large or very small in terms of managed capital.

Export credit agencies

Export Credit Agencies (ECAs) play a crucial role for sustainable development by facilitating the financing of RE products and services. These agencies are public agencies and entities supplying government-backed loans, guarantees and insurance to corporations from their home country. They aim to invest in developing countries and emerging markets. ECAs function is to take risks or cover others against certain political and/or commercial risks resulting from the export of goods or services. ECAs are structured in such a way that they attract funds from the treasury or public capital markets and transform these funds into export finance.

Climate finance institutions

Climate finance institutions include international climate funds and intermediary institutions. Multiple government donors to channel public funds create these. The funds are directed from developed nations to climate related projects in developing countries. The notable institutions supporting RE projects are the Global Environment Facility (GEF), the Climate Investment Funds (CIF) and the Green Climate Fund (GCF). Often DFI also channel a large share of public climate finance into developing countries. Public financing has generally focused on concessional lending and grants to fund RE projects. There is an increased focus on mobilizing funds to crowd in private capital rather than for direct financing. Expanding finance beyond grants and loans to guarantees, derivative instruments, liquidity facilities and other innovative structures, provide an effective and efficient means to overcome private sector investment challenges. On the other hand, it's very important for developer to generate revenue from such RE projects as it will help the lenders to recover the capital costs.

4.3.2. Financing Channels

Senior Debt

Senior Debt is provided by Banks to finance renewable energy projects, especially during the start-up and construction phases. The lender is more risk averse and seeks to minimize losses in an event of a default. Financial institutions calculate the cost of lending by measuring the associated risks pertaining to the technology, the regulations, the returns offered, existing experience in the sector. If a project finance was to be considered, an equity contribution of at least 15-20% of the funding requirement will be required. The loan amount provided by the lender is based on specific project risk and future cash flows. The key advantage of project financing is that the debt will be at the level of project company (SPV) instead on the books of the parent company.

Due to lack of awareness and lack of RE specific policies in place, local commercial banks in many developing countries are reluctant to extend long-term loans. Instead, these banks offer a mid-term loan with a potential follow-up finance at the end of the term. The senior debt loan either is available in in USD or in local currencies, accordingly as the developers can mitigate currency related risks.

Sri Lanka Renewable Energy Program[39]

The World Bank is funding in projects related to in grid-connected, mini-hydro, off-grid village-level hydro and SHS. These funds are channelled to the MoF and Planning as an International Development Association (IDA) credit. Participating credit institutions (PCI) are responsible for channelling the funds to eligible projects based on the due diligence conducted by them. Loan amounts can also be directly provided to project sponsors or customers. Once the amount is available, PCIs may apply to the ministry for the refinancing of up to 80 percent of their loan. The amount is refinanced in the local currency. Such a mechanism helps creates a strong incentive for PCI to conduct proper due diligence by retaining their liability of 20% of the loan and, where the project is not eligible, 100 % of the loan amount.

Table 19: Advantage, Disadvantage and Uses of Senior Debt

Uses	Advantage	Disadvantage
Reduces the overall project cost significantly	• Repayment of principal frees fund, which help the developer to support to RE projects.	• The Need for due diligence to cross verify the ability of a project to generate revenue increases transaction costs
It helps in providing a long-term financing,	• It involves local commercial financial institutions in RE projects	• Leverage is limited and may crowd out potential private providers of debt.

[39] (World Bank- Financing Renewable Energy)

Table 20: Banks Involved in Funding on Renewable Energy Technology

Banks involved in funding on Renewable Energy Technology	
Deutsche Bank	United States Agency for International Development
European Investment Bank	KfW – German government – owned development bank
World Bank	International Finance Corporation
Asian Development Bank	Goldman Sachs
Softbank	SunEdison

Subordinated Debt (Mezzanine Finance)

Subordinated debt is extremely valuable in terms of financing RE projects. It can help insulate senior debt investors from unacceptable risks and reduce the cost of capital where equity is too expensive. It is important where senior debt investors are unfamiliar with the risks associated in RE projects. Some forms of subordinated debt can be converted to shares or, as in the case of preferred shares or take the form of equity but with lesser or no rights of control. High risk is compensated for by a higher rate of return as compared to RoI on senior debt. It improves the cash flows in a project and reduces the risk of senior lenders. As a result, the willingness to lend and to accept long-term loan increases.

Mytrah Energy raised USD 78.5 million from IDFC Project Equity and USD 19 million from PTC Financial Services. Solar IPP Azure Power raised USD 13.6 million from Germany's DEG[40].

Table 21: Advantage, Disadvantage and Uses of Subordinated Debt

Uses	Advantage	Disadvantage
Such funding act as a medium between equity and senior debt while taking control from the main investors	The level of leverage is high in subordinated debt	Transaction cost is high as the finance structure customized for each project
Subordinated debt help reduce the term and reduce the cost of senior debt	Attracts a greater number of Senior debts by allowing projects to meet acceptable risk criteria for lenders.	Significant risk is transferred to public financing agencies, but with only limited ability to control these risks.

Table 22: Banks Involved in Mezzanine Based Funding

Banks involved in Mezzanine based funding	
DEG- German Investment corporation	International Finance Corporation

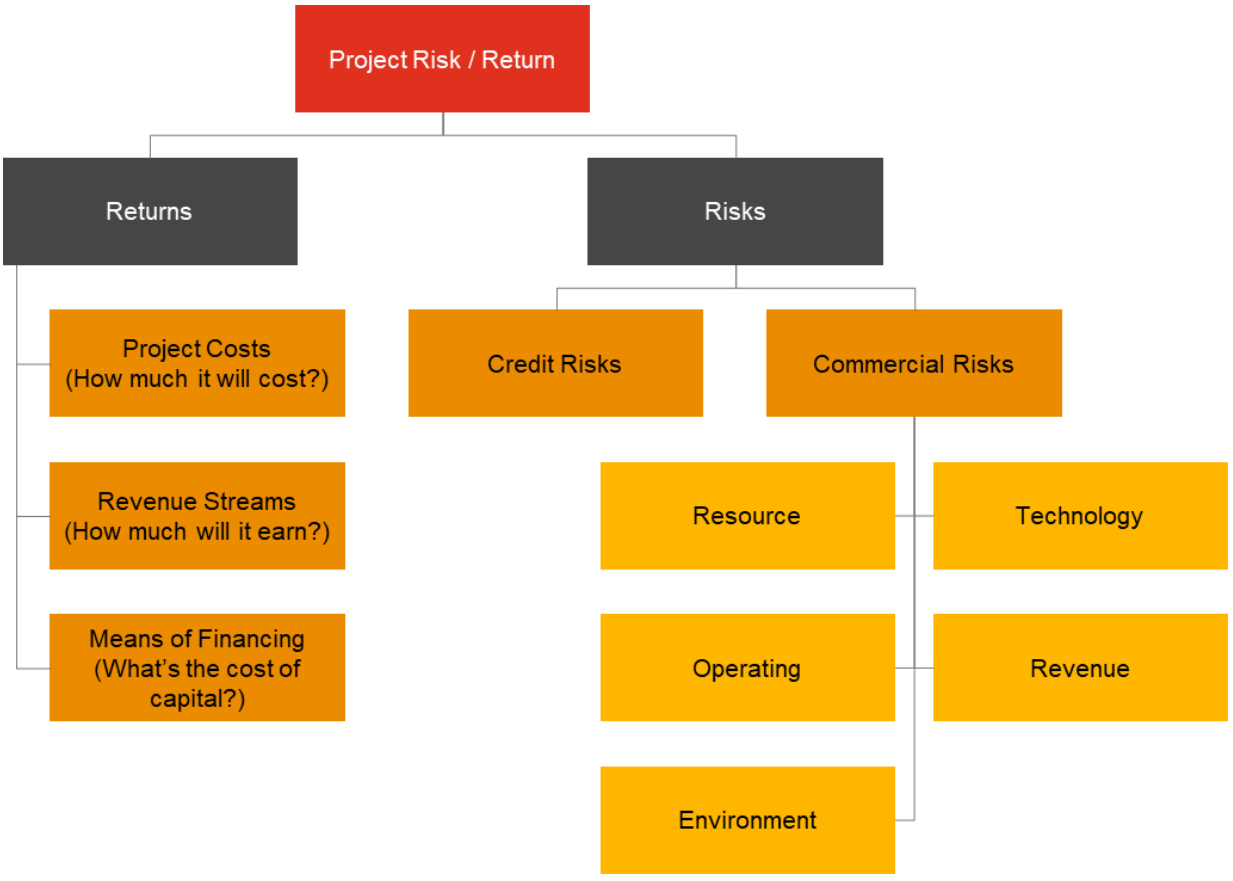
[40] (Renewable Energy Sector Funding)

Banks involved in Mezzanine based funding	
Infrastructure Development Finance Corporation (IDFC)	African Development Bank
Triodos Investment Management	Astris Finance, USA
Global Climate Investment Fund	Energy Capital

4.4. Guarantees and Insurance: Financial Instruments Addressing Investment Risks

Investors and lenders are naturally averse to risks that give rise to negative fluctuations in project cash flows. To attract investors, the RE projects should be strategized. In such a way, that it minimizes the probability of an occurrence that give rise to negative financial impact on the RE projects. There are different kinds of financial instruments which can be used to mitigate the various risks associated with financing in RE project. Financial risk instruments transfer specific risks away from project sponsors and lenders to insurers and other parties. When considering a project, a financier will usually prepare a risk/return analysis to assess each major risk, means to mitigate the potential risk in a project. Assessing the returns involves verifying the upside revenue projections (what might go right) and downside cost (what might go wrong)

Figure 10: Flow Chart depicting Project - Risk vs return



The practice of allocation of risk and due diligence is necessary and is often expensive. It is carried out to provide the financial community with a better understanding of applicable technologies, relevant markets and any new approaches to manage risks. Investor confidence is critical to attracting financing. As a result, the type of financing available to RE projects is dependent upon the risk management approaches adopted by the project's management. Followed by the instruments available to mitigate the perceived risks. Both lenders and investors attempt to make a deal that allocates risks cost-effectively and provides adequate safeguards to protect themselves.

There are insurances, which are commercially available to insure the risks. These insurances are taken to ensure a successful project finance structure is achieved by transferring risks, which are unacceptable, by the investors or lenders. Efficiency is key to the selection of the appropriate financial instruments to support RET investments. The aim should be to use the instruments that deliver the greatest amount of private funding for the smallest amount of public funds.

Instead, financial instruments used just tot fund RET projects, it should focus on risks that constraint or prohibit investors from investing in a project. Instruments must be chosen with a view to the capabilities of local agencies to manage them effectively and efficiently, and of local financial markets to understand and use them. Constraints are inevitably country specific and will require performing due diligence of risks before decisions are made on which type of instruments to use.

4.4.1. Guarantees

Government Guarantee

By issuing guarantees, governments are in a better position to mitigate project risks that help enable financing. The treasury or ministry of finance provides the government guarantees, which are required by investors and lenders for projects in developing countries. Such Guarantee reduce project and financial risks like currency risk, regulatory risk and power off-takers risks, etc. Commercial lenders at times require a government guarantee when they are not confident about the financial viability of the RE project without government backing.

Below mentioned are the major reasons for a government not being able to provide a guarantee:

- There are constraints with respect to public sector financial institutions and associated International Monetary Fund obligations. Hence, some governments can only provide

a letter of comfort (or assurance of willingness to enter a contract) through the state utility to purchase electricity from the project.

- Some governments' do not provide an additional guarantee letter on top of a government backed PPA.
- Few countries are not able to provide a guarantee for relatively small loans as they have vehicles only for larger loans.

Lenders and development funds supporting RE projects could consider the following possible alternatives to government guarantees:

- A national bank guarantee, in which a central bank or a state-level bank (public finance institution) provides guarantees to the investors or lenders of the project
- A corporate guarantee fund or trust with a credit-risk rating or other similar indicator, which ensures they comply with international solvency standards.

YAP renewable energy project [41]

The State of Yap, in the States of Micronesia, developed a 3.6 MW solar-wind- diesel hybrid project to reduce dependency on imported diesel. The total cost of the project is USD 11.14 million, and majority of the amount is debt financed by the ADB. The developer implemented tailored strategies to overcome the risks of each individual element.

- To reduce the risk of late- or non-payment of loan obligations by the borrower the Federated States of Micronesia provided a sovereign loan guarantee. It covered late payment and default risk on the part of Yap State Public Services Corporation. It satisfied the condition precedent for long-term loans provided by the ADB.
- Commercial risk associated with securing leases for the solar installations was reduced by a long-term leasehold rights to install, maintain and operate the systems on government-owned rooftops.
- To mitigate resource risk for the wind power plant, a due diligence of wind resource analysis was performed which included a long-term monitoring system.

Political Risks Guarantee

Investors are highly sensitive to the potential impact of political risk. Hence, the transfer of such risks becomes essential, especially in countries with an unstable political system or inadequate rule of law. The Multilateral Investment Guarantee Agency (MIGA), a member of the World Bank Group, is the largest public provider of political risk Guarantee. Public finance institutions have also started to issue a part of political risk guarantee. The guarantee provides a broad

[41] (IRENA Unlocking Renewable Energy Investment)

coverage of risks, which occur by political events. Below mentioned are five broad categories of risks under political risk guarantee:

- War, terrorism and civil disturbance, which may include losses from revolution, insurrection, sabotage and terrorism.
- Currency inconvertibility and transfer restriction, meaning losses arising from an investor's inability to convert local currency into hard currency due to government action.
- Breach of contract, meaning losses arising from the utility's breach or repudiation of a contract (E.g., breach of a PPA by a government entity).
- Expropriation, meaning losses arising from government action like nationalization or confiscation, which reduce investors' ownership or control over an asset
- Non-honoring of financial obligations, meaning losses resulting when a sovereign or state-owned enterprise defaults on financial payment obligations such as guarantees of loan repayment or equity injection.

For e.g., The MIGA political risk insurance mitigated such government-related risks affecting the 250 MW Bujagali hydropower project in Uganda through an event of default. It drew in a higher level of private investment than any other comparable hydropower project in the region.

Table 23: Multilateral Investment Guarantee Agency Project in Renewable Energy

MIGA Project in RE[42]				
Investor/ Guarantee Holder	**Project**	**Type**	**Host Country**	**Guarantee Amount (USD Million)**
Globeleq Mesoamérica Energy Wind) Limited, Bermuda	Eolo Wind Farm	Wind	Nicaragua	16.3
Korea Water Resources Corporation, Korea	Star Hydro Power Ltd.	Hydro	Pakistan	148.5
EVN AG, Austria	Energji Ashta Shpk (Ashta)	Hydro	Albania	159.4
Energy Engineering Investment Limited, Mauritius	Hydelec Madagascar S.A.	Hydro	Madagascar	19.9
World Power Holdings Luxembourg S.à.r.l., Luxembourg	Bujagali Energy Ltd.	Hydro	Uganda	115
EDF International, France; Fortis Banque SA, Fortis Bank NV,Belgium	Nam Theun 2 Power Company Ltd.	Hydro	Lao PDR	90.6

[42] (Miga, n.d.)

Wind-power in NICARAGUA

Nicaragua's electrification rate is among the lowest in Central America and reliance on oil-fired generating plants has made the long-term marginal electricity costs the highest in the region. MIGA's $16.3 million in guarantees to Eolo de Nicaragua S.A., a 44-megawatt wind farm in Rivas province, helped the country rectify its power-sector issues. The Agency's guarantees covered an equity investment by Globeleq Mesoamérica Energy Limited, Bermuda. The Eolo de Nicaragua project consists of 22 Gamesa G90 2-megawatt wind turbine generators, as well as the facilities and equipment required to connect the generators to a high-voltage substation. The project is estimated to generate 170 GW hours of electricity per year.

Table 24: Agency that Provide Political Risk Guarantee

Agency that Provide Political Risk Guarantee	
International Level	**Regional Level**
Multilateral Investment Guarantee Agency (MIGA)- World Bank	HDFC ERGO, India
NEXI – Japan	Xlcatlin (Presence in South Asian Countries)
SINOSURE – China	
Aon - London	

Partial Risk Guarantee

Partial risk guarantee ensures a government's obligation to compensate for loss of regulated revenues resulting from defined regulatory risk. It occurs when the government or regulatory agency changes, fails to comply with the provisions of the regulatory framework. Partial risk guarantee can backstop a government commitment in the early stages of power sector reform to ensure reliable and timely enforcement of the measures

Uncertain grid access is one of the significant factors that determine the commercial viability of a new RE projects. Such guarantees are important for covering transmission line and grid interconnection risk because these infrastructure systems are operated and owned by government entities. Partial Risk Guarantee are provided by

- International Development Association (IDA) Partial Risk Guarantee - World bank
- Asian Development Bank (ADB)

Lake Turkana [43]

Lake Turkana is the Africa's largest wind project. The project involves construction of 310 MW wind farm in the Great Rift Valley in northwestern Kenya. It comprises of 365 turbines of 850 KW capacity each and is developed by an IPP under a 20-year take-or-pay PPA signed with the Kenya Power and Lighting Company. The power generated will be cost competitive on a national basis at EUR 0.075/kWh . The tariffs are set in Euro (EUR) terms but to be paid in local currency, removing currency risk for Euro-based debt repayment. To reach financial close, the project had to dealt with transmission line delay risk to make sure the transmission line is established in time to connect the generated power to the grid. In an event of delay, the Kenya Power and Lighting Company would be exposed to financial penalties due to its inability to take up power from the wind farm. It was also a power off-taker and liquidity risk concern for the investors. The African Development Bank (AfDB) issued its first-ever partial risk guarantee through the Africa Development Fund. The bank deposited EUR 20 million into an escrow account of EUR 90 million (about USD 120 million) for the project. It ensured the off-taker's PPA payment obligations for the intial 6 months. Kenya's government has provided EUR 70 million and has also issued a letter of support to cover political risk. The partial risk guarantee played a pivotal role in the financial closure of this project.

Partial Credit Guarantee

Partial credit guarantee can cover part of the debt service default by the borrower regardless of the cause of default for a specific period of the debt term for a public investment. It is a more flexible than political risk insurance or partial risk guarantees; partial credit guarantees cover a wider range of risks. For RE projects, such guarantees address currency transfer and convertibility risk caused by host government action. For example, the IFCs partial credit guarantee can mitigate currency risk with the guarantee structured to cover only the debt service due during the estimated time of currency inconvertibility. It is a cost-effective way to reduce transfer and convert risk because it guarantees only the debt portion of the financing for a limited period. Partial credit guarantees also addresses technology risks in small and medium sized RE companies to enhance their credit limit. Given the size and the nature of RET, these companies face problems in meeting the industry standard, which prohibits them from participating in the bid processes

According to IRENA survey results, there is limited use of the above-mentioned guarantee in renewable energy investments. Little data is available to track these guarantees and to understand how these are used in renewable energy projects. Some of the limitations are summarized below:

[43] (IRENA Unlocking Renewable Energy Investment)

- Use of guarantee instruments for renewables remains limited
- Guarantees have been used mainly to support larger-scale projects
- Political risk insurance is the most common form of support
- Institutions placing priority on renewable energy issue more guarantees.
- The lack of demand for risk mitigation instruments from users, not just for renewables, is the main reason for underutilization.
- The lack of institutional incentives or resources to increase the provision of risk mitigation instruments for renewable energy investments is a limiting factor on the supply side.

Partial Credit Guarantee are provided by:

- International Finance Corporation
- Guarantee program (World bank)[44]

The renewables project (budget USD 13.8 million) was set up by developer Eleqtra for InfraCo Africa in the Bugala Island, Lake Victoria, region of the Kalangala district of Uganda. The aim was to reach some of the poorest residents while also being financially viable. Kalangala was not an easy project to finance. Besides political and currency issues, the project was exposed to a various kind of risks, which included general project risks, technical and bureaucratic complexity and offtaker/liquidity risks. A blended financial structure was designed combining concessional finance from DFIs with commercial lending and output-based assistance in the form of grants. These grants covered technical risks during the development phase. Risk mitigation instruments, meanwhile, opened access to concessional financing. The blended approach helped the project to overcome the financing barrier and, mobilize private investment as well as participation by a high-profile technology provider. Specific elements included:

- A Technical Assistance Fund, which provided access to high quality and rigorous technical analysis. The analysis helped to attract the participation of high-profile technology providers.
- A joint partial credit guarantee between GuarantCo and USAID, which addressed power off-taker risk (Uganda Electricity Transmission Company) and compensated for the lack of local currency debt with a long-term loan tenor. The partial credit guarantee provided cover to both commercial banks and institutional lenders, thereby leveraging additional private sector investment in the project. However, the negotiation and implementation of the cover took four years.

[44] (World Bank, n.d.)

- Currency hedging was achieved by matching project cash flows as closely as possible

Currency Risk Guarantee

Currency risk arises in situations in which the project has revenue in one-currency and loan payments in another. For renewable energy projects, a mismatch between the financing currency (hard) and the revenue currency (local) is often a problem for debt repayment. Due to these concerns, some transnational project developers would only sign a contract in hard currency to insulate themselves from currency risk. Although it can remove currency risk, it also opens exposure to non-payment risk if the off taker cannot pay the PPA price in hard currency. Some governments take some of the currency risk by offering USD tariffs payable in local currency. Instruments such as currency swaps can also be used for this purpose.

The Indian government[45], has been experimenting with the concept and has plans to launch such a fund to support solar development. Under this scheme, distribution companies will quote their price for solar energy in hard currency (USD) with a lock in period of 25-year and charging customers in Indian Rupees (INR). MNRE created a hedging fund of USD 1 billion by charging developers a hedging fee of INR 0.90/kWh (about USD 0.015/kWh). The fees would be transferred to an escrow account to cover against local currency depreciation. It will help developers access international capital and reduce high hedging costs. In addition, it will drastically reduce cost of currency hedging in the market. Indian government is in the process of planning such a fund. It includes consideration of the right amount of hedging fee to be charged

4.4.2. Insurance

Table 25: Traditional Insurance Products Available for Renewable Projects

Risk transfer product	Basic triggering mechanisms	Scope of insurance/ risks addressed	Coverage issues/ underwriting concerns
Construction All Risks (CAR)/ Erection All Risks	Physical loss of and physical damage occurred during the construction phase	Risks of physical loss or damage and third-party liabilities including all contractor's work	• Losses associated with cable laying. Quality control provisions for contractors.
Delay in Start Up (DSU)/Advance loss of Profit (ALOP)	Delay caused in the completion of a project due physical damage	Loss of revenue	• Cable laying risk. • Loss of transformer. • Lead times for replacement of major items.

[45] (IRENA Risk Mitigation and Structured Finance)

Risk transfer product	Basic triggering mechanisms	Scope of insurance/ risks addressed	Coverage issues/ underwriting concerns
			• Offshore wind weather windows and availability of vessels.
Operating All Risks/ Physical damage	Sudden and unforeseen physical loss or physical damage to the plant / assets during the operational phase of a project.	All-risks package.	• Explosion/fire concerns for biogas, geothermal. • Increase in fire losses for wind. • Lightning. • Quality control and maintenance procedures.
Machinery Breakdown (MB)	Mechanical and electrical breakdown, which requires repair or replacement.	Defects in material, design construction, erection or assembly.	• Concern over errors in design, defective materials or workmanship for all RETs. • Turbine technology risk. • Scope and period of equipment warranties. • Wear and tear (excluded from MB).
Business Interruption	Damage to the plant/assets during the operational phase of a project causing an interruption.	Loss of revenue because of an interruption in business caused by perils insured under the Operating All Risks policy.	• Cable/transformer losses represent large potential scenarios. • Lead times for replacement of major items. • Offshore wind weather windows and availability of vessels. • Supplier/customer exposure (e.g. biomass resource supply).
Operators Extra Expense	Sudden, accidental uncontrolled and continuous flow from the well, which cannot be controlled.	All expenses associated with controlling the well, redrilling/ seepage and pollution.	• Some geothermal projects require relatively large loss limits. • Exploration risk excluded. • Well depths, competencies of drilling contractors.
General/ Third-Party Liability	Liability imposed by law, and/or Express Contractual Liability, for Bodily Injury or Property Damage.	Includes coverage for hull and machinery, charters liability, cargo etc.	• Concern over third-party liabilities issues associated with toxic and fire/ explosive perils.

4.5. Evolution of Innovative Finance Models/Structures

4.5.1. Green Bonds

Green bonds are the fixed income financial instruments that are used to promote and to implement environment solutions. In this instrument, the issuer of the green bond gets a capital to finance green projects while the investors receive fixed income in the form of interest. When the bond matures, the principal is repaid. In a way, green bonds are the same as any corporate, they are a subset of corporate bonds, and where the use of proceeds are allocated to environment related activities. The European Investment Bank issued the first green bond in 2007 and raised Euro 600 million under the label Climate Awareness Bond. These bonds constitute a small fraction of the global debt market. Hence, green bond has a huge potential to grow in the debt market around the globe. Given the overall scenario of RET available in the market, the fixed income bonds are suited to finance because of the following reasons:

- RETs are capital intensive fixed investments in nature
- RETs have a low variable cost in the project lifetime
- RE projects generate steady paybacks and low-risk revenue streams over long periods of time once the investments are up and running.

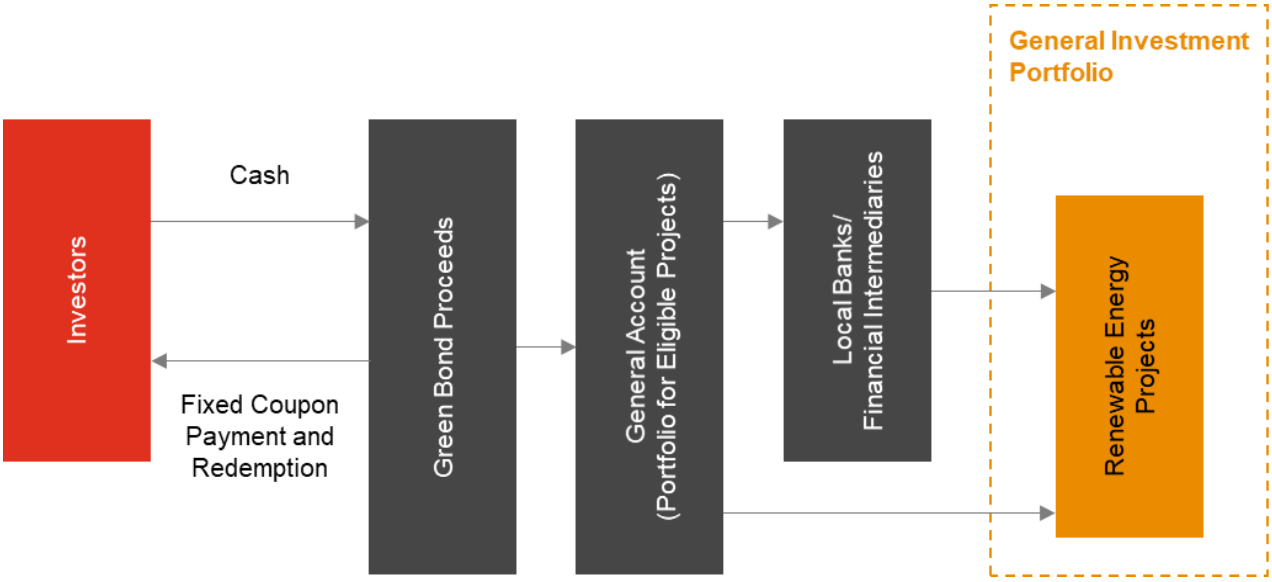
Table 26: Green Bond Issuers

Green Bond Issuer - International	Green Bond Issuer - Regional Level	Green Bond buyer
World Bank	Yes Bank, India	Blackrock
European Investment Bank	IREDA, India	Aviva Investors
IFC	NTPC, India	Goldman Sachs
Toyota	L&T, India	KFW trillium asset management
Ile De France	SBI, India	Calvert investment

How Green Bonds can be used to fund Renewable Energy Projects

The issuer intends to invest in greener projects. The issuer raises funding from the investors in exchange of Green Bonds. The investors are paid a fixed interest and the principal amount will be paid after the maturity of the project. The funds issued, will be provided to local banks and other financial institutions who directly invest in RE projects. In some cases, the issuer invests directly on RE projects. The risk involved for the investors is hence minimized as the project risk are borne by the issuer. Because the risk is minimized for the investors, the investors allocate large amount of funds on RE projects.

Figure 11: How Green Bonds can be used to Fund Renewable Energy Projects



Scope in Monetary terms

Green bonds were demanded by environmentally and socially responsible investors, but market opportunities extend beyond this category of investors. Combined with continuing growth in corporate green bonds. According to climate bond initiative, the labelled green bond market could reach **USD 300 Billion** of issuance by 2018. China and India have emerged as key markets, with a 73 % of share of green bonds issuances in emerging markets. The Agricultural Bank of China issued the first green bond by a state-owned Chinese bank in 2015, mobilizing a total of USD 1 Billion. In 2015, Xinjiang Gold Wind Science & Technology issued a USD 300 million bond for which it received orders worth USD 1.4 Billion.

India entered the green bond market in 2015 with the YES Bank issuing the first green bond for financing the clean energy projects, especially for wind and solar. Since then the green bond market has expanded to several public sector undertakings, state-owned commercial banks, financial institutions, corporates, and the banking sector. TERI analyzed 25 key green bonds which have been issued in India by various players. The average coupon rate for domestic issuers is on a higher side 7.5% compared with 4.7% for international issuance. The difference in the coupon rate is linked to the currency risk of the Indian Rupee (INR).

Stakeholders [46]

- **Green Bonds issuer(s)**: Any company, government agency or financial institution that develops, registers and sells a bond. The issuer usually selects a financial institution as an underwriter to administer the issuance of the bond. The Chinese Government, Toyota and

[46] (United Nations Development Programme, n.d.)

the World Bank are only a few examples

- **Green Bonds investor(s)**: Individuals, companies or institutional investors who buy green bonds with the expectation of a financial return. They include individuals, institutional investors
- **Green Bonds partner(s)**: A broad spectrum of organizations interested in developing a commercially viable green bond market, including financial institutions, development banks, NGOs, credit rating agencies, etc.
- **Credit rating agencies and auditors**: institutions responsible for verifying compliance with the standards for green bonds or established credit standards.
- **Regulators**: Financial authorities responsible for regulating capital markets; they examine the qualifications and the securitization of credit assets and bond custodial arrangements. Regulators include securities commissions and other regulatory bodies, including stock exchanges and central banks.
- **Credit guarantors and other intermediaries**: Creditor guarantors provide credit guarantees and credit enhancement products in secondary markets, thus modifying the risk profile of the underlying bond. A wide range of financial intermediaries offers a variety of intermediation and credit enhancement services, including raising investor capital, establishing special purpose vehicles etc.

Table 27: Advantage, Disadvantage and Risk Associated with Green Bonds

Advantage	Disadvantage	Risk
Investors benefit from green projects, which helps them to deliver on the commitments made as signatories to the Principles for Responsible Investment.	The lack of consensus regarding what constitutes a green bond is a source of uncertainty	The main risk of debt is the default of the issuer. Default risks are bond specific and relates to the capacity to generate sufficient cash flow to repay interest and capital
These bonds have greater transparency in the use of proceeds from a bond and ensure that the climate impact of fixed income investments is reported.	Transparency and reporting are weak in the green bond market. As the market grows, transparency will emerge as an increasingly important issue.	The structuring of a bond implies additional risks to be factored, as with bonds with variable interest rates. Secondary instruments (e.g. currency forwards and futures) exist to help hedge these risks, but at a cost.
Green bonds play a positive role in building expertise and raising awareness among investors	The cost of issuing green bonds might be lower in the future.	Variability in transaction costs and issuance fees, particularly for low value issues in developing countries might make other financial mechanisms more affordable.
As the financial risk and return of green bonds are the same as classic bonds, the main benefits are lower interest rates	If the green bond is issued abroad, additional risks, including changes in foreign market regulations on capital	Variability in the taxation of debt market instruments can influence investors' decisions

Advantage	Disadvantage	Risk
	flows, and exchange rates, should be accounted for.	
Local governments and companies can profit from the increase in demand from socially responsible investors		Evaluating the environmental benefits claimed by issuers of green bonds has been a key issue since the market started to grow

4.5.2. Infrastructure Investment Trusts (InVITs)

InvITs are instruments that work like mutual funds. InvITs are designed to pool small sums of money from a number of investors to invest in assets. Part of this cash flow would be distributed as dividend back to investors. There are four important parties to an InvIT — sponsors, investment managers, project managers and the trustee. InvITs are formed by complying with the regulatory authority.

The infrastructure company interested in getting funds from the public will form this trust, and then appoint an investment manager who will be responsible for how the assets and investments of the InvIT are managed. There is also a project manager, who executes the projects. The investment manager oversees it. Since the instrument is essentially a trust, the company will also appoint a trustee, who must ensure that the functions of the InvIT, investment manager and project manager comply with regulatory rules.

According to SEBI, India there are certain rules that the InvIT issuers have to follow to safeguard the investor. First, the sponsor should hold a minimum 15 % of the InvIT units with a lock-in period of three years. Second, InvITs have to distribute 90 % of their net cash flows to investors. The trust is required to invest a minimum of 80 % in revenue generating infra assets. Only the rest can be used for under-construction assets. Dividends from the trust will be distributed to the investor depending on its cash flow and there is no dividend distribution tax on InvIT units. InvITs are suitable for high net worth individuals, institutional and non-institutional investors like pension funds, foreign portfolio investors, mutual funds, banks and insurance firms.

4.5.3. Carbon Financing

A carbon credit is a generic term for any tradable certificate or permit representing the right to emit one tonne of carbon or carbon dioxide equivalent (tCO_2e). Carbon credits aims to mitigate the growth in concentrations of greenhouse gases (GHGs). One carbon credit is equal to one ton of carbon dioxide, or in some markets, carbon dioxide equivalent gases. Carbon trading is an application of an emissions trading approach. Greenhouse gas emissions are capped and then markets are used to allocate the emissions among the group of regulated sources. The

goal is to allow market mechanisms to drive industrial and commercial processes in the direction of low emissions. Since GHG mitigation projects generate credits, this approach can be used to finance carbon reduction schemes between trading partners around the world. There are companies that sell carbon credits to commercial and individual customers who are interested in lowering their carbon footprint. They purchase the credits from an investment fund or a carbon development company that has aggregated the credits from individual projects. The quality of the credits is based in part on the validation process and sophistication of the fund or development company that acted as the sponsor to the carbon project.

A Certified Emissions Reduction (CER), is a certificate issued by the United Nations to member nations for preventing one tonne of carbon dioxide emissions. These are usually issued to member states for projects achieving greenhouse gas reductions using Clean Development Mechanisms (CDM). CDMs make it possible for these projects to occur and set a baseline for future emission targets.

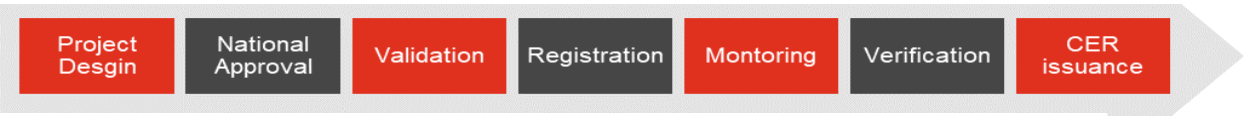
Creation of CER (Certified Emission Reductions)

To generate CERs, a project must go through the **CDM Project Cycle**, a rigorous and public registration and issuance process designed to ensure that a project has produced real, measurable and verifiable emission reductions that are additional to what would have occurred without the project. The process is overseen by the **CDM Executive Board** and involves documentation of project design, host-country approval, validation, registration, monitoring and verification. **CERs** that have completed the cycle are issued and tracked by the Executive Board in the **CDM (Clean Development Mechanism) Registry**. The **CDM project cycle** includes:

- The host country should take necessary approval from the Designated National Authority
- Submitting a detailed project design document
- Validation of the project by an accredited independent auditor.
- Validation of registration.
- Monitoring of emissions in accordance with the project design document, and verification of emission reductions by a DOE.
- The Executive Board issues and registers the CER.

The below mentioned diagram depicts the project cycle of clean development mechanism.

Figure 12: Clean Development Mechanism (CDM) Project Cycle[47]



[47] (United Nations Framework Convention on Climate Change, n.d.)

Scope in monetary terms

Potential revenues from the sale of carbon credits depend on carbon prices, the volume of credits generated, and the length of the period over which credits may be generated and sold. Nearly 8,000 CDM projects are registered, of which energy projects comprise over 75 per cent and waste handling and disposal projects comprise 11 per cent. CER have issued for 2,824 project activities, which totals to over 1.6 billion ton of CO_2 of emission reductions. China is the largest issuer accounting for over 60 per cent of issued CERs.

Carbon prices depend on supply and demand. Annual average market prices fell from a peak of USD 20/ ton of CO_2 in 2008 to USD 0.19/ ton of CO_2 in 2014. Under the new Paris mechanism, demand will come from both industrialized and developing countries, which suggests prices will rise. However, high prices may encourage some countries not to abide by their commitments, which would put downward pressure on the price.

Credits Can Finance Renewable Energy Development [48]

Financing of RE projects via carbon credits is a new concept. RE firms like C TRADE are working to help develop RE projects through carbon financing. The company's president, Prabhu Dayal, explained: "We have developed Biogas projects to help local organizations and farm owners where the potential funding from CDM carbon credits. It will be used to recover our cost for design, development, construction and operation." C-TRADE develops RE projects in developing countries and finances them partly by having the rights to the carbon credits that the project will generate. Its biogas RE projects turn waste manure from farms into electricity that the farmers use. The projects are completed on a Build-Operate-Transfer (BOT) basis, transferring the asset to the farmer at the end of the agreement period. C-Trade finances the entire operation. Because many of the RE projects in India tend to be on the smaller scale, innovative business models have made aggregation of investments possible in these projects. Developers of these projects are starting to use the growing market for carbon credits to finance a part of their project costs.

Table 28: Advantage, Disadvantage and Risk Associated with Certified Emission Reduction

Advantage	Disadvantage	Risk
Climate crediting mechanisms offer significant revenues for low-carbon technologies	At current market prices for CERs, the cost of undertaking a new CDM project is difficult to justify as it may exceed the ultimate revenues, particularly when discounted for time and risk	The CDM project cycle does not guarantee that a project will be secure finance or generate CERs

[48] (Renewable Energy World, n.d.)

Advantage	Disadvantage	Risk
Long-term price stability can encourage realignment of investments towards low-carbon solutions.	Financing project costs can be challenging, given that CERs are issued only after monitoring and verification and banks are generally unfamiliar with CERs. As a result, carbon revenues are not particularly helpful in securing financing.	The long lead time for investments and the volatility of carbon prices, price risk is a major concern for project sponsors. It can be mitigated by signing long-term offtake contracts.
CERs are standard financial instruments that can be freely traded and are eligible for use in a number of regimes in addition to the CDM.	Identifying financing may be challenging, especially given that CDM-eligible technologies tend to have higher up-front costs than conventional ones.	Project sponsors face regulatory risk, particularly given that it will take some time for the rules for the new market-based mechanism to be elaborated.
The CDM provides widely accepted, robust processes for measuring greenhouse gas emission reductions.		

4.5.4. Small-Scale Project (SREP) Financing

Small-scale renewable energy projects (SREPs) play a crucial role in increasing deployment of renewables in developing countries. Small projects are well suited to conditions in emerging markets as they allow developers and banks to gain experience at limited risk profile and small-scale projects. However, financing options in these markets are not well-aligned with the needs of small-scale projects. Given the high costs of project finance transactions, small projects are typically financed with corporate loans, which are not designed to finance RE investments. Risks include high interest rates, short tenors that doesn't comply to the long-term nature of RE. These prevent viable projects from being pursued and hinder the long-term development of the renewables sector.

SREP by **THE LAB by Climate Policy Initiative** aims to improve financing conditions for SREPs. It helps to make more projects bankable and contributing to the transformational development of local institutions to enable a wider scale-up. The SRFF incorporates two financing approaches:

a. Discounting Facility

This facility would refinance projects post-construction through a tailored approach that discounts future cash flows from power purchase agreements (PPAs). It allows a project to obtain lower priced, long-term debt and higher leverage. Post-construction refinancing is normally not available to SREPs and is cheaper than pre-construction financing because of

- Lower due diligence costs

- Significantly less risk (as there is no construction risk). Once SREPs are refinanced, sponsors will be able to take equity out of projects and, as a precondition of accessing the Facility, invest it in new projects.

For solar, wind, and hydro there is no fuel price risk, except limited technological and operational risks and power off take risk. Large-scale projects already have access to financing vehicles that allocate risks reasonably well. They are typically financed using loans used in construction and are refinanced at better terms post completion once construction risks are eliminated. However, such options are not normally available to SREPs.

b. Mezzanine Facility

This facility would provide construction financing in the form of a subordinated loan backed by donors and DFIs, in conjunction with a senior loan provided by a local bank. It would substantially decrease equity requirements and improve financing conditions for new projects. The Mezzanine Facility is well-suited for markets with significant SREP potential but few existing projects. Such a facility would benefit significantly from a technical assistance facility. It would be available to all projects, not only those from sponsors that have used the Discounting Facility.

Project Eligibility

Small RE projects that generate electricity from hydro, wind, or solar PV will be eligible for refinancing through the Facility provided they meet the following conditions:

- Operational for at least a year
- Capacity between 1-20 MW.
- Has a Power Purchase Agreement (PPA) or a feed-in tariff with a creditworthy entity for at least ten years after the refinancing.
- Positive technical appraisal from a contracted engineer.
- Project loan amount is less than 10% of fund assets but not more USD 25 million
- Project complies with local environmental laws and regulations, and the ESG standards of the Facility.
- Plant equipment is sourced from a manufacturer with an acceptable track record and the manufacturer and/or Engineering Procurement and Construction (EPC) contractor has provided a performance guarantee

Barriers in Making Small Renewable Energy Bankable

- **High equity/collateral requirements**: Small-scale projects financed using a corporate finance approach often require 40-50% equity or even more.

- **Risks mispriced**: RE projects that are constructed and have long-term offtake agreements carry significantly less risk than their financing package
- **High transaction costs**: Pre-completion, due diligence costs of SREPs, in particular small hydro, are unavoidably high. In addition, bank processes are not optimized for the needs of SREPs and more importantly, the risk they represent. This adds significant costs to the project.
- **Inappropriate financing terms and conditions not suited for SREPs**: Local banking sectors may not consider SREPs to be an attractive or prominent market segment, and therefore do not provide loan products tailored to these projects. Traditional loan products have different financial characteristics and are not effective vehicles for financing SREPs.

4.5.5. Asset Backed Securities (ABS)

Asset backed securities are bonds or similar instruments, which are backed by the cash flow generated by RE projects. Asset-backed securities are used for refinancing projects that are generating positive cash flows, although they can also be issued in the form of project bonds ahead of construction. Such refinancing offers a potential way to free up public funds that have been committed for development and investment, thereby allowing these funds to be refinanced to support new projects. ABS require financial markets able to analyze and value the risks associated with such securities and, to price them. The experience with mortgage-backed securities in the recent financial crisis shows how even the most sophisticated markets can get this wrong. ABS is an innovative financial instrument to raise funds. According to Kroll Bond Rating Agency Transaction report, the total ABS market value increased in 2017 to USD 1.3 billion from USD 321 million in 2016.

Table 29: Advantage and Disadvantage of Asset Based Securities

Advantage	Disadvantage
These are generally long term and lower cost loan	Sophisticated markets required to be able to analyze and price the risk associated with this type of security.
ABS is one of the innovative ways to refinance projects and thereby allowing the developer to further invest	
Potential to bundle projects together in a single security can reduce risks and substantially reduce financing costs	

Table 30: Few Players in Renewable Energy Securitization Market

Few Players in Renewable Energy Securitization Market	
Mosaic – USA	Sunnova Solar Energy - USA

Few Players in Renewable Energy Securitization Market	
Dividend Solar Finance	AES Distributed Energy - USA

4.6. Assessing Financing Instrument

Identification of appropriate instrument for addressing financing barriers and project risks

This section briefly covers the different types of instruments that can be used to address different barriers. These instruments are offered by the host government or by the private entity.

Table 31: Financial Risk Tools to Address Investment risks[49]

	Political Risk	Policy and Regulatory Risk	Power off-taker Risk	Grid Interconnection & Transmission Line Risk	Technology Risk	Currency Risk	Liquidity and Refinancing Risk	Resource Risk
Government Guarantee	✓	✓	✓					
Political Risk Insurance	✓	✓	✓	✓		✓		
Partial Risk / Credit Guarantee	✓	✓	✓	✓	✓			
Export Credit Guarantee	✓	✓	✓	✓	✓			
Currency Risk Hedging Instrument						✓		
Currency Risk Guarantee Fund						✓		
Local Currency Lending						✓		
Internal / External Liquidity Facility			✓				✓	
Liquidity Guarantee							✓	
Put Option							✓	
Grant and Convertible Grant								✓
Resource Guarantee Fund								✓

[49] (IRENA Risk Mitigation and Structured Finance)

5. Supply of Finances

Post Analysis of the various types of financial instruments available, this section majorly focuses on various financial measures taken by the SAARC member states. It broadly covers fiscal incentives and different Programmes, which are provided by the SAARC nations. Apart from this, the issues/barriers faced by the implementing agency and mitigation measures for the same have been briefly covered in this section.

5.1. Fiscal Measures and Subsidies

Afghanistan[50]

In Afghanistan, the RE projects are funded through donor funds. In order to attract adequate investments from the private sector, the government has set up various financial incentives. The upfront capital support in the form of subsidies is provided to all RE projects. The amount and subsidy vary depending upon the technology, location and the design of the project. For instance, stand-alone projects providing basic energy services to remote communities, projects supported by women, or benefiting women and children may receive the highest allocation of subsidies. Afghanistan Renewable Energy Policy (AREP) have designed these incentives to encourage healthy investments by the investors. Below mentioned are some of the key fiscal incentives:

- The investors can benefit from the interest subsidies and soft loan that will be provided by the local banks. It also has low interest rates, moratorium/ grace period on repayment and favourable debt-equity ratio.
- The AREP has also implemented policy to exempt Customs duty and sales tax for the import and sale of machinery equipment and spare parts,
- The investors will be exempted to from Income tax for the RE projects for the first 5 years from the commercial operation date.
- The government of Afghanistan will provide security during project implementation.
- The upfront capital support in the form of subsidies will be provided to all RE projects in order to make them viable by either improving the RoI or by reducing the tariffs for commercial and domestic consumers.
- The Government of Afghanistan will help the project developers in the acquisition of land required for setting up grid- connected and mini-grid RE projects. The project developer will be required to get into a separate land lease agreement with the

[50] (Afghanistan Renewable Energy Policy)

concerned authorities.

- Licenses will be issued to the project developers as per the Electricity service law for generation, transmission and distribution of electricity from all RE projects above 100 kW capacity, as well as for their O&M. The project developer will not require license for setting up or operation & maintenance related activities in RE projects, which are less than 100 kW capacity.

Bangladesh[51]

Recognizing the challenges, the Government of Bangladesh (GOB) has adopted a multi-pronged strategy in the power sector. The RE Policy (2008) of GOB laid out the target for meeting 5% of total power demand from RE sources by 2015 and 10% by 2020. GOB has proposed the use of PPP and private investments in addition to public investments. To attract private investments, the GOB has articulated different fiscal incentives. The following lists GOB's incentives for private sector:

- The private power companies shall be exempt from corporate income tax for a period of 15 years.
- The companies shall be allowed to import plant and equipment and spare parts up to a maximum of 10% of the original value of total plant and equipment within a period of 12 years of Commercial Operation without payment of customs duties, VAT (Value Added Tax) and any other surcharges.
- Exemption from income tax in Bangladesh for foreign lenders to such companies.
- The foreign investors will be free to enter into joint ventures, but this is optional and not mandatory.
- The companies shall be exempted from the requirements of obtaining insurance/reinsurance only from the National Insurance Company, namely Sadharan Bima Corporation (SBC). Private power companies will be allowed to buy insurance of their choice as per requirements of the lenders and the utilities.
- The investors will be exempted from stamp duty payments for Instruments and Deeds
- The GOB has declared the power generation as an industry. As a result, the companies will also be eligible for all concessions, which are available to industrial projects.
- Avoidance of double taxation in case of foreign investors based on bilateral agreements.
- There is a provision for transfer of shares held by foreign shareholders to local shareholders/ investors.
- The investor will largely be benefitted from with the facility to convert TAKA, the

[51] (Rapid Assessment GAP analysis Bangladesh)

national currency, into international payments in current account.

- If the investor wishes to re-invest, then the remittable dividend will be treated as new foreign investment.
- Foreign owned companies duly registered in Bangladesh will be on the same footing as locally owned companies regarding borrowing facilities.

Bhutan[52]

The energy sector in Bhutan has been developed by Royal Government of Bhutan (RGoB) agencies with public funding and with additional support from development partner countries such as India, Netherlands, Norway, Austria, Japan and others, and multilateral agencies such as the ADB, UNDP and World Bank. The RGoB wishes to change the situation by promoting and incentivizing the private sector to fully participate in RE projects. Policies such as the Foreign Direct Investment Policy, the Hydropower Development Policy, and the draft Renewable Energy Policy are all supportive of greater private sector participation and investments in the energy sector.

- Investments in large hydropower projects (150 to 1,000 MW) are open for joint ventures with Bhutanese companies or eligible for 100% foreign direct investments
- The equity participation by any single foreign investor will be limited to three large projects with total installed capacity not exceeding 2,000 MW.
- Private project developers are exempted from payment of corporate income tax for a period of 10 years from the commercial operation date of the hydropower plant.
- Project developers are also exempt from payment of all import duties and Bhutan sales taxes on import of plant and equipment during the construction period, and further, no sales tax or duties are to be levied on the export of electricity
- Repatriation of capital and remittance of dividends will be allowed subject to the provisions in relevant RGoB laws governing foreign investments.
- Investors who wish to develop projects in remote areas will be eligible for an additional five years tax holiday
- Investors in the manufacturing and integration of RE products in Bhutan will be exempted from income tax for a period of ten years.

India [53]

The RE space in India has become very attractive from investors perspective and has received FDI inflow of more than US$ 6.26 billion up to December 2017. India has also ranked second in the RE Attractiveness Index 2017. As of 2017, India has achieved 58 GW of renewable power

[52] (Rapid Assessment GAP analysis Bhutam)
[53] (New and Renewable Energy Sector - India)

while the Government's target is to generate 175 GW from RE by 2022. India's RE sector will need a cumulative investment of USD 450 billion over 2016-2040 to reach estimated cumulative installed capacity of 480GW by 2040. The Indian Renewable Energy Development Agency (IREDA) was established under the Ministry of New and Renewable Energy (MNRE) as a specialized financing agency to promote and to fund RE projects. Various schemes, which are offered under the government initiative in solar sector are:

- **Tax holiday under the domestic income tax law**: Undertakings engaged in the generation or generation and distribution of power have been offered a 10-year tax holiday for RE plants. However, the plants must pay a minimum alternative tax at the rate of approximately 20.4 to 21.4 percent which can be offset over the next 10 years.
- **Generation Based Incentives (GBI)**: Under MNRE's Generation Based Incentive scheme, wind power projects are eligible for an incentive of INR0.50 per unit of power fed to the grid for a minimum period of 4 years and a maximum period of 10 years, subject to a ceiling of INR10 million per MW.
- **Accelerated depreciation:** Under the domestic income-tax law, companies involved in developing RE projects such as solar and wind are provided with accelerated depreciation at 80 percent. However, windmills installed on or after 1 April 2012, but before 1 April 2014, would be eligible for depreciation at the rate of 15 percent on WDV basis only.
- **Tax and fiscal incentives**: Tax cost forms a substantial part of engineering, procurement and construction (EPC) project costs, which can range from 10 percent to 20 percent of the total RE project cost. Few state governments have provided incentives of VAT at 5 percent, a significant reduction over the 15 percent VAT rate levied by some other states.
- Government has recently approved amendments in tariff policy in Jan 2016 which envisages long term trajectory of Renewable Purchase Obligation (RPO) prescribing purchase of solar energy to promote renewable energy with an aim to reach up to 8% of total electricity consumption by March 2022.
- Under the **Scheme for Development of Solar PV Power Plants on Canal Banks and Canal Tops**, an incentive of INR 3 crore/MW or 30% of the project cost, whichever is lower, for Canal Top SPV projects and Rs. 1.5 crore/MW or 30% of the project cost, whichever is lower, for Canal Bank SPV projects will be granted.
- **National Offshore Wind Energy Policy, 2015**: This policy promotes deployment of offshore wind farms up to 12 nautical miles. Under this policy, single window clearance is offered to the investors with a tax holiday of 10 years for offshore wind energy generation.

- Under the **National Solar Mission**, various incentives like zero import duty on capital equipment and raw material is provided. Apart from this, low interest rate, priority sector lending and capital subsidies are also offered to the investors.

Maldives

With the target to turn carbon neutral by 2020, the country has refined the policy to attract foreign investment specially in the RE sector. To meet its target, the country would require USD 110 million per year for the next 10 years. Maldives have plans to cut down the import of oil for electricity generation. The financial incentives are the same across all the sectors. Some multilateral agencies like UNDP, USAID, UNOPS, UN-ESCAP have invested in the different RE projects in Maldives. Below mentioned are the list of incentives that are provided by the government of Maldives for the foreign investors. [54]

- Import Duty is exempted for importation of Capital Goods for development management and operation of the Zone[55]
- The investors are exempted from Goods and Services Tax for first 10 years and Business Profit Tax
- The investors have an opportunity to get duty exemption on capital goods brought in for development of facilities.
- There will be elimination of import duty for RE products
- The promotors will have the facility to convert the local currency to any international currency without any restrictions.
- To promote high value investment above USD 1 billion, the investors will be getting the ownership of the land.
- The investors will be free to repatriate profits and capital proceeds.
- The project developer will be allowed to hire expatriates
- The investor will be exempted from the payment of Withholding Tax for the first 10 years.

Nepal[56]

Nepal offers subsidies under the RE Subsidy Policy to promote renewable energy use in rural and remote areas, and partly funds research on RETs. In May 2016, the renewable energy subsidy policy was updated, introducing generation-based support rather than capital-based subsidies. It also covers solar mini grids alongside hydro projects of up to 1 MW. The aim is to increase efficiency in operations and to encourage private sector involvement. In August 2016,

[54] (Investment opportunity in Maldives, 2015)
[55] (http://investmaldives.gov.mv/opportunities.php, n.d.)
[56] (Government of Nepal- Office of Investment Board, n.d.)

the Government of Nepal published the incentive delivery mechanism, intended to come into effect after approval from the Ministry. Below mentioned are the incentives that are provided by the government of Nepal to the private investors:

- The tax rates in BOOT projects of construction of powerhouse, hydro power generation and transmission will be 20% as compared to normal tax rate of 25%
- Income generated by an entity from the export of power will be taxed at 20% as compared to normal tax rate of 25%
- Licensed person or entity producing electricity through hydro, solar, wind and biofuel, starting its commercial production, transmission or distribution within April 12, 2024: tax holiday - 100% exemption for 1st 10 years and 50% exemption for next 5 years.
- The investors will not be required to disclose the income source for the investment made in hydro projects.
- To further lower the taxes that will be paid by the investor, the new policy allows depreciation at the rate of 33.3% for BOOT projects, construction of powerhouse, hydro power generation and transmission.
- Investment made during a year on replacement of old machineries after deduction of the accumulated depreciation till that year allowed to be booked as expense.
- 50% depreciation shall be allowed in the year of purchase of equipment to produce energy for the business.
- VAT exemption on the import of machinery, equipment, tools and their spare parts, penstock pipes or iron sheets used in hydro power projects and not produced in Nepal.
- In forward losses carry category the normal provision is 7 years but in construction of powerhouse, generation and transmission of electricity the forward losses carry provision is 12 years.

Pakistan[57]

The government of Pakistan has proposed financial measures aimed at cutting the use of fossil fuels and promoting alternative energy sources, while also protecting the environment. Numerous initiatives have been taken in line with the Alternative and Renewable Energy Policy 2006 guidelines, leading to positive RE sector development in Pakistan. Alternate Energy Development Board (AEDB) has led most of these initiatives. It has used its own resources, often also supported by bilateral and multilateral development partners, to remove barriers to private sector investment.

- The investor will be exempted from customs duty or sale tax for machinery equipment and spares which are meant for the initial installation or for balancing, modernization,

[57] (Policy for development of RE for power generation)

maintenance, replacement, or expansion after commissioning of projects

- The equipment that are imported for RE projects is exempted from import duties.
- Repatriation of equity along with dividends freely allowed, subject to rules and regulations prescribed by the State Bank of Pakistan Sponsors can raise local and international financing including corporate bonds
- Exemption from income tax, including turnover rate tax and withholding tax on imports.
- Zakat is typically charged at a rate of 2.5% on dividends paid to Muslim shareholders. However, it is exempted for all non-Muslim and non-resident shareholders.[58]
- It shall be mandatory for the power distribution utilities to buy all the electricity offered to them by RE projects established in accordance with the provisions
- For all power produced above than the benchmark level, a production bonus payment shall be made to the IPP
- Permission to issue shares at discounted prices to enable venture capitalists to be provided with higher rates of return proportionate to the risk.
- Non-residents can purchase securities which are issued by companies in the country without the State Bank of Pakistan's permission but subject to prescribed rules and regulations.

Sri Lanka

The board of Investment (BOI)[59] has come up with different incentives that are available or had been available for the promotion and utilization of RE options in Sri Lanka in varying degrees, in different regions for different target groups. These incentives are available as a package while in some cases it is just one of them depending on the need. To achieve its RE targets, the government of Sri Lanka has proposed the following incentives to attract investors:

- Complete foreign ownership is permitted for investment in most of the areas of the economy and there is no restriction on foreign exchange transaction relating to current account payments
- Permission is granted for the issue and transfer of shares in a company up to 100% of the issued capital of such company, to approved country funds, approved regional funds, corporate bodies incorporated outside Sri Lanka and individual's resident outside Sri Lanka
- Imports of both capital goods and raw materials are duty free for export-oriented industries/services
- BOI offers tax holidays ranging from 3 to 15 years for investors in districts other than

[58] (A Solar developer's guide to Pakistan)
[59] (Board of Investment - Sri lanka, n.d.)

Colombo and Gampaha

- Special package of tax incentives ranging from 10 to 20 years is offered for investment in the Eastern and Northern Provinces.
- The Corporate Tax exemption period shall be decided, from the commencement of the year of assessment in which the enterprise commences to make profits or any year of assessment not later than two years from the COD, whichever is earlier.[60]
- Any dividend paid to a shareholder of a small, medium or large-scale company, are exempted from Dividend Tax during the tax holiday period

5.2. Key Financial Undertaking/Programme

Afghanistan

a. Institutional Development for Energy in Afghanistan (IDEA)[61]

- **National Level**: The project helps develop the necessary political and legal framework for an improved energy supply. The institutions involved are strengthened by clarifying the mandates and roles, responsibilities and defining the tasks more specifically.
- **Private sector**: The necessary legal and financial framework are developed to make sure the desired investments are invested by the private sector.
- **Coordination and cooperation**: Structures and mechanisms at national level and between the national and provincial levels will be ensured such that energy measures are aligned to the local circumstances and requirements.
- **Consumers and companies**: Key information of the energy sector are collected and are made available to both consumers and companies.

b. Decentralized power supply through renewable energies[62]

The objective of the programme is to provide the residents of Afghanistan and commercial enterprises with electricity from RE sources. The programme aims to increase employment, to promote economic growth and to improve living conditions of the Afghan people. Currently, a renewable energy project is under construction. Once operational and connected to the municipal grid, it will provide electricity to 60,000 of residents.

c. Afghanistan Sustainable Energy for Rural Development (ASERD) Programme[63]

The programme aims to establish sustainable rural energy services in more than 50,000 households. This programme starts in 2015 and is expected to achieve its goal by 2019. It will

[60] (Investment guide - BoI Sri Lanka)
[61] (Institutional Development for Energy Afghanistan, n.d.)
[62] (German Cooperation with Afghanistan, n.d.)
[63] (Afghanistan Sustainable Energy for Rural Developme, n.d.)

establish frameworks for policy, regulation, environmental protection, quality control and incentives, and develop human and institutional capacity. Under this programme, 1,948 solar water heaters will be distributed at subsidized rates, 180 mini and micro grids will be implemented using RE sources. Apart from this, 1,948 biogas digesters will be constructed.

Bangladesh

a. Renewable energy and energy efficiency Programme (REEEP)[64]

The objective of the programme is to ensure that energy is available to more people in Bangladesh. Energy efficiency has improved, and more electricity comes from renewable and environmentally friendly sources. The REEEP strategy is to increase the use of RE and to increase the energy efficiency while formulating concepts for their generation. The Programme includes pilot activities that will ensure market sustainability, which will focus on building technological and a suitable regulatory environment. The Programme act as a bridge between the different stakeholders, development partners, financial institutions and regulatory authorities. REEEP has development of the regulatory frameworks needed to promote RE and energy efficient technologies, that lead to notable outcomes. The programme has offered technical support for the installation of about 1,500 biogas plants, which have achieved a commercial production level of 5 MW. Apart from this, it has also installed 122 separate solar powered drinking water plants, which will help to secure a sustainable and safe drinking water supply for more than 0.5 million people in six coastal districts of Bangladesh.

b. Solar Home System Initiative[65]

The Solar Home Systems (SHS) initiative began in January 2003. The government-owned Infrastructure Development Company Limited (IDCOL) facilitated the solar home system initiative. The aim of this programme is to fulfil the basic electricity requirement of the off-grid rural people of Bangladesh. Initial funding from the World Bank was extended several times over the years via Rural Electrification and Renewable Energy Development Project. The programme has selected local partner organization as the promoters of SHS. As on May 2017, 4 million solar home systems had been installed and directly impacting more than 12 % of the entire Bangladesh population. As a result, this initiative has helped saved the Bangladesh government USD 411 million by reduction in consumption of kerosene by 1.14 million tons.

Bhutan

On-going initiatives by the Royal Government of Bhutan and Development Partners[66]

Bhutan has undertaken several energy sectors projects to add power generation capacity, expand energy access and implement RE systems. While few programs are funded entirely by

[64] (Renewable energy and energy efficiency programme, n.d.)
[65] (Solar Home System Initiative in Bangladesh, n.d.)
[66] (Rapid Assessment GAP analysis Bhutam)

the RGoB, many other are co-funded by development partner countries and bilateral and multilateral agencies. The Governments of India, Austria and Norway are supporting several hydropower feasibilities studies.

- **Government of India**: Support for various hydropower feasibility studies and financing for hydropower plants
- **Government of Austria**: Support for hydropower feasibility studies
- **Government of Japan/JICA**: Support for rural electrification projects.
- **ADB**: Support for rural electrification projects, preparation of a RE plan, and provide technical assistance
- **UNDP**: Baseline study on EE potential in transport, buildings, industry and agriculture, and support for development of an EE policy
- **Government of Norway/NORAD**: Cooperation between Bhutan's Department of Hydropower and Power systems (DHPS) and Norwegian Water Resources and Energy Directorate (NVE) for the project "Strengthening of the Energy Sector" and Bhutan's Department of Geology Mines (DGM) and the Norwegian Geotechnical Institute for 'Mitigation of Geo-hazards related to Hydropower

India

a. National Solar Mission[67]

The objective of the National Solar Mission is to establish India as a leader in solar energy, by creating the policy conditions. The aim of the mission is to

- create policy framework for the deployment of cumulative target has been revised to 100,000 MW by 2022. The target comprises of generation of 40 GW via rooftop solar installations and 60 GW through large and medium scale GRID connected solar power projects.
- promote programmes for off grid applications, to 1000 MW by 2017 and 2000 MW by 2022
- achieve 15 million sq. meters' solar thermal collector area by 2017 and 20 million by 2022
- deploy 20 million solar lighting systems for rural areas by 2022.
- create favorable conditions for solar manufacturing capability, particularly solar thermal for indigenous production and market leadership.

[67] (Jawaharlal Nehru National Solar Mission)

b. Wind Power Programme

As on Dec 2015, installed capacity of 25,188 MW wind turbines has been commissioned. Under National Wind Resource Assessment programme, Nodal Agencies have installed and monitored 794 dedicated Wind Monitoring Stations (WMS) of height ranging from 20 m to 120 m. Initially the wind monitoring was carried out only in known windy areas but now it has been extended to new areas.

c. Biomass power & cogeneration programme

The programme was implemented with the objective to promote technologies for optimum use of the country's biomass resources for grid power generation. Biomass materials that are used for power generation include bagasse, rice husk, straw, cotton stalk, coconut shells, soya husk, de-oiled cakes, coffee waste, jute wastes, groundnut shells, saw dust etc. It has been estimated that surplus biomass at about 120 – 150 million metric tons per annum is available, which covers the agricultural and forestry residues corresponding to a potential of about 18,000 MW. Apart from this, about 5000 MW additional power can be generated through bagasse-based cogeneration in the country's 550 Sugar mills.

d. Biomass gasifier programme[68]

The aim is to meet captive electrical and thermal needs of rice mills and other industries, which in turn help in saving of conventional fuels such as coal, diesel, furnace oil etc. The focus is to connect small biomass gasifier-based power plants up to 2 MW capacities to the tail end of grid as it provides multiple benefits such as reducing T&D losses, ensuring sustainable supply of biomass, access to electricity in villages etc. The Programme aims to implement projects with involvement of Independent Power Producers (IPPs), Energy Service Companies (ESCOs), industries, Co-operative, Panchayats, SHGs, NGOs, manufactures or entrepreneurs, industries, promoters & developers, etc.

e. Small Hydro Power Programme

MNRE has been given the responsibility of developing Small Hydro Power (SHP) projects of capacity up to 25 MW. The country has a potential to generate about 20,000 MW from small hydro power plants. Most of the potential is in Himalayan States as river-based projects and irrigation canals in other states. The SHP Programme is now essentially private investment driven. Projects are normally economically viable and private sector is showing lot of interest in investing in SHP projects. The viability of these projects improves with increase in the project capacity. MNRE has set target to harness at least 50% of the potential in the next 10 years.

[68] (Support Programme- MNRE, n.d.)

f. National Clean Energy Fund (NCEF)[69]

The programme aims to support entrepreneurial ventures and research in the field of clean energy technologies. The contributions to the NCEF are made via levy of Rs. 50 per tonne of coal which is collected by the Central Board of Excise and Customs (CBEC). Indian Government is expected an additional amount of INR 10,000 crore under the NCEF by 2015. The NCEF has become one of the important sources for lowering cost of financing for renewable energy sector. Under the revised policy, the NCEF will be used to finance Grid interactive and distributed renewable power and R&D in renewable energy sector.

Maldives

a. Accelerating Sustainable Private Investments in Renewable Energy (ASPIRE)[70]

All projects in this programme are based on a feed-in tariff with the use of appropriate guarantee instruments from the World Bank Group as a risk mitigation tool for leveraging private investments. It will target several waste-to-energy projects. This programme consists of waste-to-energy for outer islands, solar PV for the Greater Malé region and solar PV/wind for 30 islands with medium or large electricity consumption.

b. Preparing Outer Islands for Sustainable Energy Development (POISED)

Electricity generation from solar PV and wind in some locations is less expensive than energy generated from diesel. The programme supports full implementation of RE systems on 10 islands with low electricity consumption. It also equips the power systems for a 20-30% share of intermittent RE on 15 islands with large and medium electricity consumption.

c. Thilafushi Waste-to-Energy

The programme aims to provide a waste-to-energy power generation facility with a capacity of up to 4 MW to replace the existing diesel-based power generator on the island. This is part of the broader Government National Solid Waste management policy. The Maldives SREP Investment Plan only considers the implementation of the waste-to-energy facility even though this is part of the larger-scale waste management solution including the collection, processing and disposal of waste in the Greater Male region.

d. Technical Assistance for Renewable Energy Scale-up

These activities will help strengthen the enabling environment and human capacities and identify additional renewable energy investment opportunities and data collection. The World Bank has been supporting the government's efforts to move towards a low carbon development path by helping to acquire necessary technical institutional capacity in RET. The Clean Energy for Climate Mitigation Project under the Maldives Climate Change Trust Fund

[69] (Enabling low cost financing in RE in India)
[70] (Renewable Energy roapmap-maldives)

program demonstrated the viability of RETs into the power mix in island communities. The project has provided a successful model for future interventions in carbon mitigation in the Maldives.

Nepal[71]

a. Urban Solar Programme

Urban solar is programme which is implemented in electrified area of country by national grid through Alternate Energy Promotion Center (APEC). The objective of the program is to address shortage of energy and inefficient consumption of electricity, which has caused great discomfort in everyday life of urban areas and hugely hindered the development of country. It also aims to promote RETs and energy efficient technologies in electrified areas.

b. Nepal Alliance for Clean Cookstoves (NACC)

The NACC is an alliance of organizations engaged in all renewable clean cooking technologies including Improved Cookstoves, solar cookers, biogas and electricity-based cooking. Fossil fuel-based technologies such as LPG, kerosene etc., despite being clean cooking options, have not been included within the scope of NACC as these are outside the purview of AEPC.

c. Waste to Energy

Nepal is looking at waste-to-energy (WtE) technologies to address its huge energy deficit and manage growing urban and industrial waste. Half of Nepal's households are off the national grid while supply shortfalls and interrupted power cause industries losses worth USD 700 million annually. Biomass sources identified by the proposals include human faeces, cattle manure, chicken litter, agricultural waste and organic municipal solid waste.

d. South Asia Sub Regional Economic Corporation

Alternative Energy Promotion Centre (AEPC) has received a grant from ADB to implement the South Asia Sub-Regional Economic Cooperation (SASEC), Power System Expansion Project. The executing agency for the SASEC Off-grid Component is the Ministry of Energy, Water Resources and Irrigation whilst the implementing agency is the AEPC and implemented by Project Implementation Unit (PIU). The SASEC-Power System Expansion Project will contribute to Nepal’s energy development objectives by

i. Scaling up both on-grid and off-grid renewable energy supply
ii. Facilitating cross-border power exchange
iii. Increasing access to RE in rural areas
iv. Building capacity for on-grid and off-grid power sector development

[71] (Alternate Energy Promotion Centre - Nepal, n.d.)

Pakistan

a. Sindh Solar Energy Program (SSEP)[72]

It aims to support solar deployment in the province across utility-scale, distributed generation and residential segments. This includes up to 400MW of solar park capacity (50-200MW per park), starting with 50MW that will see the first tariff-based competitive auctions in Pakistan. The Solar Park concept aims to help to reduce the risk profile for private sector developers by ensuring that land is secured, permits obtained, and power off-take is pre-arranged. The programme also aims for 15MW of distributed PV on rooftops of public sector buildings and others in the cities of Karachi as well as a target of bringing sola home systems to a quarter of a million households in areas of Sindh with poor access to electricity.

b. Roshan Pakistan Program[73]

Under Roshan Pakistan Program and Parliamentarian Schemes for Rural Electrification, more than 8,000 villages are going to be electrified through renewable energy technologies. A big share out of which would be done through solar home systems powered through solar PV modules. If 80% out of these are electrified through Solar PV module of 80 W capacity, then this accounts for a total load of around 25 MW.

c. Solar street lighting

Street lighting shares around 300 MW of total electricity consumption of the country. It is anticipated that this load would reach to around 500MW in coming days due to new installations in planning and design stages. All such load can be shifted to solar energy. Solar Street Lighting Systems powered through Solar PV modules can meet with this load. The development authorities in the country are exploring the opportunities of this shift. Their planning departments are currently working out prospects for making all new installations of street lighting through solar energy applications.

d. Solar Water Pumping

The irrigation system in most of the Arid Agricultural Areas is either dependent upon rain or water pumps. This load accounts for more than 1,000 MW. Currently, these pumps are either operated through grid or through diesel generators. The federal and provincial governments are planning to shift this load to solar energy.

Sri Lanka

a. Rooftop Initiative Programme[74]

The Ministry of Power and Renewable Energy has launched a community-based power

[72] (Sindh Solar Energy Program- Pakistan, n.d.)
[73] (Alternate Energy Development Board-Pakistan, n.d.)
[74] (Rooftop Solar Programme-Sri Lanka, n.d.)

generation project titled “Battle for Solar Energy” in collaboration with SLSEA, the Ceylon Electricity Board (CEB) and the Lanka Electricity Company (Private) Limited (LECO). The initiative aims to promote the setting up of small solar power plants on the rooftops of households, religious places, hotels, commercial establishments and industries. The target is to add 200 MW of solar electricity to the national grid by 2020 and 1000 MW by 2025 through this intervention. The Government intends to cover a target of 100,000 households through the Battle for Solar Energy scheme. Under this programme, consumers will have multiple options to generate and use electricity in their premises. In the case of electricity, they can sell any excess to the national grid or bank it for later use. The customer can select a preferred option from the following three schemes:

- **Net metering**: The rooftop solar system is connected to the grid through a net metering system. The customer should pay for the total amount of electricity consumed. If the solar electricity production exceeds the electricity consumption of the premises, the balance amount can be carried forward for future use up to 10 years. No fee will be paid for the excess electricity produced.
- **Net Accounting**: If the electricity generated by the solar rooftop system is more than the total consumption, then the consumer will be paid for the excess amount. If the consumption is greater than the generation, the consumer must pay for the excess consumed as per the existing electricity tariff structure.
- **Micro Solar Power Producer**: The total electricity produced from the solar rooftop system will be purchased by the utility. The customer will pay only for the number of units consumed to the utility.

b. Sri Lanka Carbon Crediting Scheme (SLCCS)[75]

Sri Lanka Carbon Crediting Scheme (SLCCS) is a Greenhouse gas (GHG) programme that encourage active carbon reduction or removal projects for the benefits of environment, society and the economy. It is an initiative that regulates and registers projects and requests to counterbalance the GHG emissions. The objective of SLCCS is to:

- To introduce more effective and user friendly programme that brings quality assurance to authentic GHG reduction and removal project activities.
- To encourage the projects benefited on aspects other than GHG reduction and/or removal such as helping communities to improve their livelihood, enhancing ecological services.
- To innovate paths in carbon crediting to businesses, non-profits and government entities that engage in on the ground climate action

[75] (Sri Lanka Carbon Crediting Scheme, n.d.)

- To facilitate responsible GHG emitters for voluntary, compliance Credits/offsets of quality assured emission reductions generated by approved projects.

Under this programme, three projects have been executed:

1. Kirkoswald Small Scale Hydropower SLCS project
2. Dilmah (Ceylon Tea Services) Small Scale Hydropower Bundle Project
3. Bogawanthalawa Small Scale Hydropower Project

5.3. Issues/Barriers Faced by Implementing Agency and Measure to mitigate the barriers

In the SAARC nation, the existing huge subsidies for fossil fuels places renewable energy at a disadvantage to them. The development in renewable energy sector is obstructed by different barriers which are mentioned below. The investments in renewable energy sector can take specific measures to remove the barriers. These barriers directly or indirectly hamper the promotion of renewable energy in any member state. Below mentioned are different kinds of barriers along with measures to mitigate the barriers.

Table 32: Barrier Faced by Implementing Agency and Proposed Measure to Mitigate the Barriers

Barriers[76]	Proposed Measures
Economic Barriers: It refers to cost of Renewable energy technology (RET) in developing or new market as compared to the cost of RET in matured market. The difference is high because of the capital cost for the power generation through RET's is higher as compared to conventional plants.	Different types of instruments like feed-in-tariffs, tendering schemes and tax exemptions will help mitigate the economic barriers.
Resource Assessment Barrier: Abundance of renewable resources in SAARC region has not been tapped to generate clear electricity. The main hurdle absence of reliable and accurate data. In last few years, the SAARC member states have taken several initiatives in collaboration with international agencies for renewable energy projects based on satellite data. However, non-availability of reliable data makes it difficult for countries to secure finance in renewable energy projects from the private investors.	Measuring stations can be built across different locations with each of the member states. These stations will be used to collect data on different renewable energy resources. These data can be further used to study the scope of renewable energy in that region and will help facilitate private sectors in acquiring financing renewable energy projects.
Policy Barriers: Lack of renewable energy specific policies in SAARC member states affects the development in this sector. One of the main reasons is the policy makers lack of information and awareness about RET.	Policy developers in SAARC member states can be encouraged to develop renewable energy specific policies with targets. It will enhance the share of renewable energy in the overall energy mix in the country. The private investors investing in renewable energy projects should be incentivize with soft loans at lower interest rates.

[76] (Barriers to Renewable Energy Technologies Developm, n.d.)

Barriers[76]	Proposed Measures
Technical Barriers: The absorption of power from renewable energy plants by the electric grid network is the most critical issue faced the distribution/transmission companies.	Energy storage option can be considered by the member states for supporting reliable, efficient and sustainable power sector by facilitating and integrating renewable energy projects.
Awareness Barrier: Due to lack of awareness among the general public about RET and latest technological advancement, the deployment of RETs in SAARC nations becomes tougher. Lack of public support makes it repellent for policy makers to enact legislation for implementation of RETs.	Awareness campaign through print, electronic and social media can be used to educate the public about the advantages of RETs.
Market Support Barriers: The local market lacks engineering base, understanding of the technology and capability to develop indigenous renewable energy products. Due to absence of local components, the private sector must import the component, which increases the cost of renewable energy projects.	The government may facilitate the collaboration of local manufacturing industries for knowledge sharing, capacity building and transfer of technology among themselves.
Infrastructure Barrier: Due to absence of grid infrastructure, power evacuation from the renewable energy plants is not possible. It is one of the prime barriers to many investors. The access to high voltage transmission lines at doorstep is critical for the energy delivery from the projects	To attract huge initial investments, it is important to build grid infrastructure for transmission of electric power from generation sources to the end user. The transmission planning for any future projects in specific location must be done in advance for timely evacuation of power.
Regulatory Barriers: The absence of independent energy regulatory and legal framework restricts the private sectors to invest in renewable energy projects. It makes it difficult for the project developers to intact the EPC cost.	An independent electricity regulator should be created or empower the existing one with charge of regulating electricity tariffs, developing transparent policy subsidies, ensuring safe and affordable electric power to the consumers. The regulator may develop guidelines for power off-take and Grid interconnections to integrate renewable energy projects with electricity Grid.

6. Mobilizing International and Regional Funding

6.1. Attracting Investments

Scaling up renewables gives us the opportunity to meet energy needs that support economic development and growth and at the same time pursue social, environmental and climate objectives. To help create market conditions in the renewable energy sector that allow investors to overcome investment hurdles; governments and public finance institutions will need to engage proactively. They will need to focus on a set of targeted policies and dedicated instruments and mechanisms supported by effective facilities. Policy makers and public finance institutions can deal with key investment risks and underlying barriers by deploying the right financial tools and taking actions targeted at renewable energy. The sections below have a brief description of some of the measure that can be undertaken to attract investments in the renewable energy space.

6.1.1. Institutionalizing the Clean Energy Policies

Table 33: National Renewable Energy Finance Strategy[77]

Objectives
• Incorporate externalities into the price of energy (i.e. align market price with true cost);
• Remove perverse incentives;
• Management of renewable energy finance programs by independent organizations;
• Reduce the cost of renewable energy technologies;
• Combining Regulation with Targeted Intervention;
• Fill financing gaps that the private sector cannot address;
• Accompanying Non-financial Interventions.

Tools			
Regulation		**Targeted Intervention**	
Energy Policy	**Finance Policy**	**Public finance programmes**	**Non-financial interventions**
• Feed-in tariffs • Tax incentives • Quotas and targets • Self-supply regulation	• Environmental, Social and Corporate Governance lending criteria • Green Bonds	• Tailored package of financing instruments (with flexible design) • Independent governance	• Capacity building • Knowledge management/ expertise

[77] (IRENA-Financial Mechanisms and Investment Frameworks for Renewables in Developing Countries)

Tools			
Regulation		**Targeted Intervention**	
Energy Policy	**Finance Policy**	**Public finance programmes**	**Non-financial interventions**
	• Differentiated interest rates • Public banking	structure, public-private partnership	• Multi-stakeholder coordination

An effective national policy on renewable energy is the crucial first step to shape the markets and geographies that financiers find attractive for investments.

The SAARC Member States have ministries and policies in place that cater to developing the renewable energy sector. However, in many cases the policies remain on paper and significant progress couldn't been made on the ground. On the other hand, some other Member States have made significant progress in policy execution and are being lauded for the same at the world stage. As a first step, the SAARC Member States must co-operate through policy conferences, which may be conducted by the SEC or other agencies to exchange notes at the highest bureaucratic level on their existing renewable energy policies that have worked for them. If SAARC as a region has very strong renewable energy policies in place, it will benefit each of the members making the region an attractive place for renewable energy investments. Additionally, the Member States will gain greater clarity and confidence to invest in each other's countries.

Incorporating externalities into the price of energy:

In the absence of government policy, free markets alone are unable to incorporate the cost of social and environmental externalities into the price of energy. Externalities are a true cost of production and, in a perfect market, would be reflected in prices. When externalities are not factored into price, the environmental and social costs of production are borne by taxpayers and future generations instead of being borne by the companies that are responsible for incurring the costs. When externalities are included in energy prices, renewable energy will become more financially viable because it will not incur environmental and social costs to the same extent as non-renewable energy will. The market will then be able to shift more resources into the sector based on standard cost-benefit analyses, without requiring government subsidies.

Energy Auctions Drive Renewable Energy Investment in Brazil[78]

The Brazilian Government carries out energy auctions annually to support the viability of

[78] (IRENA-Financial Mechanisms and Investment Frameworks for Renewables in Developing Countries)

national manufacturing of renewable energy technology by ensuring stable demand. Under the regulatory structure introduced in 2004, most new power projects participate in auctions for long-term PPAs with energy distributors who are required to enter into long-term contracts for all their electricity demand via a reverse auction system. In the auction process, the regulator informs participants (energy companies) that there will be a tender for a specific technology. The companies advise how much energy they can create for what price, and a competitive bidding process ensues. The government offers the winner a 20-year PPA, providing substantial incentive for competition among the private bidders and pushing prices down.

Removing Perverse Incentives:

Aside from off-loading the cost of externalities, non-renewable energy plants often additionally benefit from an existing policy environment that favours and may subsidize these energy sources. Subsidies for non-renewable energy are perverse incentives that support an economic model that is not environmentally sustainable in the long term. The short-term impact on energy consumers of shifting subsidies must be carefully managed to avoid political backlash.

Thailand Funds Renewable Energy through Taxation of Non-renewable Energy[79]

A particularly progressive aspect of Thailand's national renewable energy strategy is that it funds renewable energy development through taxation of non-renewable energy sources. Thailand's Power Development Fund, which provides financial support for renewable energy generation, is capitalized through a levy on fossil fuel generation with rates that vary according to the amount of emitted pollution and fuels used. Thailand's national biofuels committees, moreover, are supported by approximately USD 3 million in palm oil taxes. Finally, a levy on petroleum products raises about USD 50 million per year and is used to fund the Energy Conservation Promotion (ENCON) Fund.

Management of renewable energy finance programs by independent organisations:

Many experts recommend that renewable energy financing programmes should be managed by organisations that are "independent", meaning that their decisions should not have to be ratified by anyone in the executive or legislative branches of government. The aim of this strategy is to protect the mission of the programmes from political interference. An independent organisation can exist in any legal sector: public, private or non-profit. If in the private sector, however, it should have a not-for-dividend structure so that all profits are reinvested in the mission. Such companies are sometimes referred to as "common good" corporations. This protects the mission from being compromised by the need to maximise

[79] (IRENA-Financial Mechanisms and Investment Frameworks for Renewables in Developing Countries)

profits for shareholders. The lack of a central organisation acting as the focal point to bring together the academic, business and government communities to address the renewable energy innovation and diffusion challenge in a coordinated manner.

Table 34: Range of Legal Structures among UNEP SEF Alliance Members[80]

Type of Legal Entity	Country	Programme
Public agency	Ireland, Chile	• Sustainable Energy Authority of Ireland • Chilean Energy Efficiency Programme
Public-independent	Finland	• Finnish Innovation Fund
Development bank	Mexico, Chile	• Mexican Agricultural Trust Funds Development Bank • Chilean Economic Development Agency
Non-profit	Canada	• Sustainable Development Technology Canada
Private not-for-dividend ("common good") company	UK	• The Carbon Trust

Indian Renewable Energy Development Agency Ltd (IREDA)[81]

In today's fractional reserve banking system, banks create the money supply by leveraging capital into loans. Most of the modern money is created in this way. At an 8% capital requirement, capital can be leveraged by a factor of 12, so long as the banks can attract enough deposits to clear outgoing checks. Using public finance to establish or increase the capital of a special-purpose renewable energy bank, along the lines of the IREDA, can provide an excellent option for leveraging finance into renewable energy sectors while also establishing a lasting, independent, self-sustaining finance institution that will require no additional future support from the government. IREDA was incorporated in 1987 as a public limited company and non-banking financial institution under the administrative control of the Ministry of New and Renewable Energy to promote, develop and extend financial assistance for sustainable energy projects.

IREDA has for many years been the main provider of credit to renewable energy and EE projects in India and has played a catalytic role in market development, leading to commercialization of renewable energy technologies. IREDA provides direct loans to developers of renewable energy and EE projects; creates and manages innovative instruments for structured financing, securitisation and refinancing; and administers several government programmes on behalf of the ministry. Current financing schemes include project financing, equipment financing, and financing through intermediaries.

[80] (IRENA-Financial Mechanisms and Investment Frameworks for Renewables in Developing Countries)
[81] (IRENA-Financial Mechanisms and Investment Frameworks for Renewables in Developing Countries)

IREDA has been the main cooperating partner and channel in India for lines of credit for renewable energy projects from multinational and bilateral development banks and international funds. IREDA also raises funds from the domestic markets through bonds and loans.

Reduce the cost of renewable energy technologies:

When designing policies, attention should be paid to whether a given regulation supports the process of price discovery to drive down renewable energy costs. Where regulation blocks this process, then deregulation or regulatory reform can be appropriate for enabling entry and exit of new renewable energy providers into (and out of) the local market. The process of price discovery within the renewable energy sector requires free entry and exit of new and competitive renewable energy providers into local markets. Encouragement should be provided to the local manufacturing industry for manufacturing renewable energy equipment such as solar photovoltaics, batteries for electric vehicles, wind turbines, and solar hot water collectors. This will automatically reduce the cost of these technologies, develop an export market and provide employment in the SAARC region. In Brazil, China and India the RE manufacturing industry has created 1 million jobs and China has bagged the position of the largest supplier of RE equipment in the world.

Combining Regulation with Targeted Intervention:

Regulatory frameworks that mobilise finance for renewable energy can employ both energy policy mechanisms (*e.g.* feed-in tariffs, quotas and tax incentives) as well as finance policy mechanisms (*e.g.* banking regulation, interest rates and other monetary policy mechanisms, "Green Bonds" schemes, or establishment of special purpose renewable energy financing vehicles. Targeted intervention implies public renewable energy finance mechanisms combined or coordinated with accompanying non-financial interventions (*e.g.* renewable energy capacity building and knowledge management). The most meaningful public finance programmes employ a flexible package of financing mechanisms, which may take the form of credit lines to local finance institutions; project debt financing; loan softening programmes; guarantees to mitigate lending risk, grants and contingent grants for project development costs, equity, quasi equity and venture; or carbon finance facilities. They will also seek to engage a range of stakeholders from across the public, private, academic and non-profit sectors, both nationally and internationally. It can be advantageous for these programmes to be managed by independent, mission-driven organisations.

Targeted Intervention by the Indian Government[82]

India's government has established ambitious capacity targets to deliver renewable energy deployment. This includes 100 GW of solar energy, 60 GW of wind energy and 10 GW of biomass energy by 2022 along with 50 GW of hydropower by 2017. These goals are supplemented by policy support through a range of subsidy mechanisms. In addition to these energy policies, India has established several finance policy mechanisms described below:

Priority sector lending:

In 2015, the Reserve Bank of India introduced renewable energy into the priority sector lending category, which would incentivize banks to lend to this segment. Priority sector lending allows an increased lending cap and preferential interest rates for renewable energy projects as part of the Reserve Bank of India's priority lending sectors. The inclusion of renewable energy into the priority lending sector is enabling commercial banks to prolong the loan tenor from 10- 15 years to 20-25 years.

A revolving National Clean Energy Fund:

The pool of money is collected by a clean energy tax on coal to support environmental and renewable energy projects. The Indian government is also considering a currency risk guarantee fund to cover potential losses against local currency depreciation.

Green bond issuance guidelines:

The Securities and Exchange Board of India – the securities markets regulator – views the green bond market as a key tool to help raise the finance needed to meet India's ambitious targets. This country entered the green bond market in 2015, issuing USD 1.1 billion in green bonds from several sources.

In January 2016, the Securities and Exchange Board of India released its official green bond requirements. These set guidelines on the green bond issuance review, reporting and tracking process.

Fill financing gaps that the private sector cannot address:

Both the regulatory and public finance approaches are important because targeted public funding can fill or overcome specific financing gaps and barriers to renewable energy investment. At the same time, public finance should not be used as a substitute for underlying policy change when the latter is the more appropriate means to overcome a particular investment barrier or risk, so long as there is the option of making the necessary systemic

[82] (IRENA-Financial Mechanisms and Investment Frameworks for Renewables in Developing Countries)

improvement. Some methods, which are used, are as follows:

- **Public sector purchases** of "green power". In this case, the public sector through its green electricity purchases provides both direct demand for green power and assists in developing a voluntary green market in general.
- **Mandated Market Schemes:** The **mandated quantity** approach (a quantified off-take of renewable power defined by law) or the **mandated tariff** approach (economic terms for off-take and connections defined by law and confirmed in standard contracts between the commercial actors)
- **Smart Subsidies** reaching intended markets only and encouraging least cost option to achieve social goals at least cost while providing incentives for business to serve target markets.

Accompanying Non-financial Interventions:

Aside from designing tailored national financing packages, various non-financial interventions are also key to remove renewable energy investment barriers and should be part of the holistic package of financing instruments and non-financing measures. Capacity building should target three separate groups:

- Project developers, to prepare business plans for assessment;
- local finance institutions, to understand how to assess renewable energy projects; and
- public officials and administrators, to understand how to design and implement renewable energy policy.

This is particularly critical in uncertain and evolving regulatory environments where timing costs and development risks are significant. Programmes should therefore emphasise technical assistance and capacity building, and should channel funds, where possible, through local FIs in order to increase learning, knowledge transfer and absorptive capacity among local actors. Institution building (related to government ministries, universities, research institutes, businesses, and civil society) also has a cost that must be anticipated to ensure a long-term impact.

6.1.2. Reducing the investor cost and increasing investor confidence & decreasing risks associated with renewable energy projects

A range of barriers can obstruct the development and financing of renewable energy projects. An important factor to explain this is the front-loaded cost structure of most renewable energy projects. The limited experience and capacity of policy makers and national financial systems is also a fundamental obstacle to increasing renewable energy investment, even where this

would be economically and commercially efficient. In practice, this means that risk-adjusted capital, i.e. capital which accounts for the risk return profile, is still not sufficiently available in potential growth markets for renewable energy projects.

Risk mitigation instruments and structures are still not used enough, contributing to the high cost of capital for renewables projects.

Table 35: Types of Investment Constraints in Renewable Energy[83]

Project start-up and development	Investment risk management	Scaling-up investment
• Limited experience in the financial sector • Availability of investment ready projects • Limited access to capital	• Political risk • Policy and regulatory risk • Counterparty risk (power off-taker risk) • Grid interconnection and transmission line risk • Currency risk • Liquidity and refinancing risk • Resource risk • Technology risk	• Insufficient investment size and high transaction costs • Financial regulations restraining illiquid and riskier investments

Constraint: Project Start-Up and Development

One of the biggest barriers affecting the release of renewable energy investment is the shortage of investment ready or bankable projects with an attractive value proposition. For many investors, the inability to find projects mature for investment is a significant constraint. This is sometimes due to lack of information about opportunities in a new market. Developing renewable energy projects requires a comprehensive understanding of due diligence processes and applicable regulations, and the ability to prepare project proposals and financial documents covering all project development stages. In many developing countries such as the SAARC Member States, for most newcomers in the renewable energy industry – it is not always easy to gain the necessary technical capacity, skills and resources for such tasks. Planning and zoning authorities may require special expertise to identify the social, economic and environmental criteria that renewable projects should satisfy.

Key Solutions

Technical assistance and grant funding for project development and document preparation can increase the renewable energy deal flow and improve the pipeline of projects ready for investment. SAARC Member States can collaborate with each other to conduct in-depth

[83] (IRENA-UNLOCKING RENEWABLE ENERGY INVESTMENT: The Role of Risk Mitigation and Structured Finance, 2016)

technical and feasibility studies such that each member state can come up with investment ready project opportunities and save investor cost in doing comprehensive due diligence. These projects can secure financing at an earlier stage and generate sustainable revenue streams with all the necessary components aligned beforehand, so that investors feel confident in long-term project success. Improving renewable energy market transparency and liquidity requires interactive project facilitation support. Transparency must encompass information on projects, investors, financing sources and mechanisms, legal and technical advisory services and regulatory procedures. One such example is IRENA's Sustainable Energy Marketplace, an online platform supplying similar information to relevant stakeholders. It aims to create a global virtual platform with regional hubs (Africa, the Caribbean and Latin America, and more), to connect project developers and owners with financiers, investors, and service and technology providers. Users can search for projects with specified investment criteria, financing sources or advisors.

Several project preparation facilities that help generate more deal flows by addressing the gap in early-stage financing, include the following:

1. Cabeólica received a technical support grant from the **Private Infrastructure Development Group**, a technical assistance facility for resource assessments and technical studies. This included data on wind pattern across regions and technical engineering studies. In addition, the grant facilitated access to high-quality and rigorous technical analysis and attracted high-profile technology providers. A technical assistance grants to the Yap Renewable Energy Development project ensured that earlier delays caused by inadequacies in the bidding and procurement process were eliminated. Appropriately skilled engineering consultants were thus engaged as design and supervision consultants who provided technical feasibility studies for wind, solar and diesel generation, along with environmental and social impact assessment study.

2. **Clean Energy Finance Facility for the Caribbean and Central America** is a collaborative financing mechanism pooling US government expertise and resources to catalyse greater public and private sector investment in clean energy infrastructure in the Caribbean and Central America. The facility provides support for essential project development costs to encourage investment in clean energy projects, including renewable energy. In particular, the US Trade and Development Agency leverages its project planning expertise and early-stage funding to support activities in eligible low- and middle-income countries.

3. **The Ukraine Sustainable Energy Lending Facility** was established by the EBRD (European Bank for Reconstruction and Development) to foster renewable energy

power generation projects in the Ukraine using a simplified and rapid approval process to reduce transaction costs. In addition to loans, the facility provides project developers with technical assistance from international and local experts. This includes improving feasibility studies and preparing documents required for project appraisal, permitting and licensing, commercial negotiations and loan applications.

4. AfDB created the **Africa's Development Infrastructure Project Preparation Facility Special Fund**. It is designed as a facility with a distinct role in financing regional/continental project preparatory activities through grants. These activities include advisory services, feasibility studies, environmental and social impact analysis, technical assistance, workshops and seminars to support renewable energy projects amongst other infrastructure interventions.

Constraint: Investment Risk Management

Investment risks comprise of risks that make investors weary of investing in developing countries because these markets are not as stable as the developed markets. These risks are political risk, policy and regulatory risk, counterparty risk, currency risk and technology risk to name a few. However, it is in the developing markets that a vast majority of investment opportunities lie today. Thus, SAARC nations can employ several creative solutions that can combat these risks and provide a conducive environment for investments.

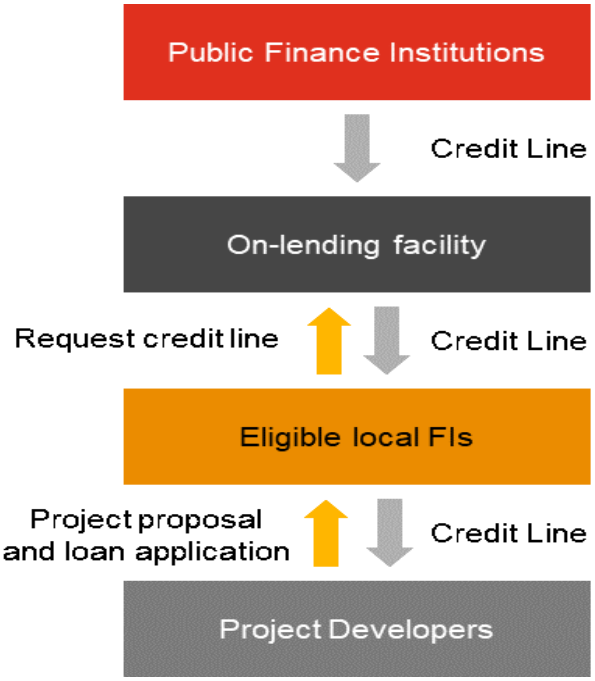
Key Solutions

Chapter 4 of this report deals with financial instruments that can be used to combat each of the investment risks. Additionally, some other solutions are as follows:

On-lending

On-lending, also known as financial intermediary lending, can increase the availability of local debt, improve access to local financing and help build local lending capacity. Many DFIs (Development Finance Institutions) use their high credit quality and market access to borrow debt at low rates and on-lend them via credit lines to a government or other institution. While not necessarily cheaper than ordinary loans, the local lender may access consultancy services and training to develop feasible projects, thus building experience and a track record. This practice reduces the local banks' risk, making them more willing to lend, and improves the overall effectiveness of the investment. From a project developer standpoint, on-lending can increase the availability of financing, possibly on better terms than it might otherwise find in the local market. An example of a typical on-lending structure is illustrated in Figure 13.

Figure 13: On-lending Structure Model[84]



On-lending facilities typically use credit lines. This is credit offered by banks which the borrower can draw upon if needed but is not obliged to. A credit line has a certain limit agreed between the lender and the borrower. When a credit line is used, the remaining limit is reduced accordingly. As the borrower repays the loan balance, the credit line is recovered and is thus of a revolving nature. Revolving, contingent credit lines are used for short-term financing needs. For example, they provide flexibility in the debt financing of businesses or act as buffer against short-term income volatility.

National governments and DFIs can develop on-lending structures targeted at small- to medium-scale renewable energy systems. Some prominent examples include the following:

The World Bank and the GEF-funded TEDAP provide credit lines to eligible commercial banks in Tanzania to support small-scale rural renewable energy projects via on-lending. When a project developer requests a loan from any of the participating banks, the local bank (after a full appraisal of the project) requests a corresponding credit line from the TEDAP administrator, the Tanzania Rural Electrification Agency. As a result of TEDAP's on-lending intervention, the interest rate was reduced from 6.24% to 5.61 % in 2011.

ARB Apex Bank, the implementing agency of the Ghana Energy Development and Access Project, acts as a mini-central bank by lending capital to a vast network of rural and community banks across

[84] (IRENA-UNLOCKING RENEWABLE ENERGY INVESTMENT: The Role of Risk Mitigation and Structured Finance, 2016)

Ghana. These in turn finance solar home systems to rural households lacking electricity. In order to facilitate on-lending schemes for off-grid renewable energy systems, the bank developed in-house technical expertise with technological knowhow.

The EBRD's Sustainable Energy Financing Facility in Turkey aims to address finance shortcomings by providing credit lines to local financial institutions for on-lending to small and medium-sized enterprises. This finances energy efficiency and renewable energy projects. This model combined concessional funding from the Clean Technology Fund, concessional funding from the EBRD and technical assistance to banks and investors financed by EU and Clean Technology Fund resources.

Facility funding of USD 289 million was channelled into 370 sustainable energy projects. This mobilised a total project value of USD 460 million between 2010 and 2012.

Bullet Loan

In this concept; an investor in need of a 15-year loan (long term) is provided with an eight year loan (short term), but the amortization profile is similar to that of a 15 year loan, except that there is a "bullet payment" due at the end of year 8, when the remaining principal has to be repaid. At that time, the bank gives a new 7-year loan to the investor to pay the bullet payment; the annual amortization payment remains the same. The procedure poses a **liquidity risk for the bank:** the bank may at the end of the seventh year period be in a liquidity crunch, preventing it from giving the seven-year loan to the bullet-payment. This risk can be mitigated by **liquidity stand-by guarantees** by a third party.

The bullet-loan approach is pilot-tested in the financing of the **West Nile rural electrification project**, a regional grid project, which is supplied by power from two mini hydro plants under construction. The World Bank World Bank gives a loan to the Bank of Uganda, which on lends the loan to the commercial bank Barclay at the average cost of capital to Barclay. Barclay offers the investor, a loan for seven years, but the client knows that in the end he will de facto get a loan for 15 years. The repayment rate is based on 15 years. To reduce the risk for Barclay a **separate credit support facility** is established, which places funds into an account to accumulate enough funds to pay the required bullet payment at the end of year 7 and take over the rest-loan. Barclay pays a fee for that facility, which is passed on to the borrower via an increase in the interest rate.

Loan syndication

DFIs can co-lend senior debt with commercial banks and distribute the risks among a broader group of lenders, thereby limiting each bank's risk-taking. This applies especially to larger and riskier projects such as offshore wind power. While no single commercial bank could extend

the large loans needed, many banks participate in a syndicate to finance such large-scale projects. When a DFI participates in loan syndication, this can facilitate local bank participation because local banks can piggyback on the development bank's experience of renewable energy project finance. Foreign banks find the participation of development banks in project finance politically reassuring. For example, DFIs with experience in a renewable energy technology could lead the early rounds of financing with soft loans.

Local banks in syndication with other banks then take the lead for later rounds. In this way, local banks can enhance their capacity and interest in lending to renewables through the knowledge gained from the early rounds. Meanwhile, borrowers' benefit from the lower cost of local financing. Through this experience, local financial institutions can build a track record and capacity in consultancy services to finance renewable energy projects on their own.

Sales-Lease-Back Arrangements for Renewable Energy-Finance

Leasing is a potentially interesting instrument for financing private renewable energy projects in developing countries. Since the financing institution maintains ownership of the financed assets, the need for other collateral is largely eliminated. Local banks, which for various reasons may be able to provide short-term finance only, can be drawn into renewable energy financing in the initial project development stage.

Grid-connected mini-hydro plants can be financed in the same way through a lease buy-back scheme, where local project developers undertake all project preparation.

Once the PPA and lease-finance agreement is signed, the project developer uses a mixture of own-equity, supplier credits and a local bank loan to finance the cost of investment up to commissioning. At commissioning of the installed plant, the national power company purchases the plant from the developer, at a price equal to the debt finance used for development and construction. The sales revenue goes to repay the debt for project development. The plant is leased back to the developer on a long-term lease-buy-back contract. At the end of the lease-period, the plant returns to the developer as his property.

Hybrid Structures

Flexibility offered by hybrid structures can also facilitate the more active involvement of public finance institutions and investors into renewables, thereby improving the project developer access to capital. Hybrid structures combine key characteristics of two financial instruments and thereby allow projects to benefit from both instruments while reducing and transferring risks. These hybrid structures include, for instance, mezzanine finance, which is subordinated to senior debt but has priority over equity. Subordinated debt can attract private investors who are not familiar with renewable energy projects. Another option is convertible grants which can be applied so that public finance supports the risky stages of project development

while providing a safety margin for failure. A third option is convertible loans, which help lower the cost of capital by providing contingent claims to capture the equity upside.

- **Subordinated debt**

Subordinated debt can help to insulate senior debt investors from unacceptable risks and reduces the cost of capital in cases where equity is too expensive. This can be especially important where senior debt investors are unfamiliar with the risks inherent in renewable energy projects. As a form of mezzanine financing, subordinated debt can be provided by public investors to attract private investors.

For example, the UK Green Investment Bank (GIB) invested GBP 70 million in a biomass plant together with the Irish Utility Electricity Supply Board. The GIB and the utility invested the capital in the form of equity and a shareholder loan, which is a type of subordinated loan. Through this structure, the equity investors were able to raise GBP 120 million from an export credit agency and two commercial banks. Such subordinated debt supported by public institutions can also work as a type of credit enhancement for senior debt.

- **Convertible grants**

Convertible grants provide the ability to shift funding from grant to loan. This instrument offers public finance institutions a useful way to support early stage project development and high-risk renewable energy technologies with the potential to benefit from loan interest. At the same time, they leave a safety buffer for project developers (the beneficiaries of public finance support) should the desired outcome not materialize. Convertible grants have been proposed in the European Union's Electrification Financing Initiative to support renewable energy and energy access projects in developing countries. Under this initiative, private sector equity investors at the early investment stage can enjoy a buffer from convertible grants. These convert into subordinated debt once they reach milestones (such as the completion of a feasibility study, financial closure, or project completion).

- **Convertible loans**

Convertible loans are like convertible grants, in that they can be converted, at certain points and at certain pre-agreed terms, into another instrument with a higher risk and return profile, in this case equity. They can support early stage project development by mitigating risks while allowing for potential upside returns to lenders. This structure can be used by public finance institutions to finance project development activities or new renewable energy technology deployment. On the one hand, convertible loans can provide the borrower with the option to repay the loan instead of equity conversion and tailor the repayment schedule according to

the project schedule. On the other hand, they allow the public finance institution to fund projects at reasonable terms compared with the high risk of the investment. The embedded opportunity and related upside potential to convert the debt into equity can result in lower cost of the debt to the borrower.

Constraint: Scaling-up Investment

When it comes to renewable energy, the projects are smaller in scale and we need to examine ways to break through barriers to attracting large-scale private investment. These barriers include, for instance, insufficient investment size, high transaction costs and limited market liquidity.

Structured finance mechanisms and capital market tools can help scale up renewable energy investment and open opportunities for institutional and other major investors to enter in the renewable energy market.

Key Solution

Structured finance mechanisms

Structured finance can help overcome such barriers, especially when the underlying investment vehicles are standardised and/or aggregated to cut due diligence costs. Many in the renewable energy policymaking and investment communities are unfamiliar with structured finance. In most structured finance transactions, project assets that will generate the cash flow must be isolated from the sponsor. This way, other investors can narrow the focus of both the risks and returns to the project itself.

Standardised project documentation and aggregation are important mechanisms in structured finance transactions. They allow assets to be pooled in larger portfolios and, under certain conditions, securitised to be traded in capital markets. They can help lower due diligence cost, better conform to investor requirements, broaden the investor pool and diversify individual asset risks.

Table 36: Structured Finance Mechanisms to Scale up Investment[85]

	Insufficient investment size and high transaction costs	Financial regulations restraining illiquid and riskier investments
Standardization	✓	
Aggregation	✓	
Securitization	✓	✓

[85] (IRENA-UNLOCKING RENEWABLE ENERGY INVESTMENT: The Role of Risk Mitigation and Structured Finance, 2016)

Standardized Contracts

One of the main contributors to transaction costs is complexity, combined with the 'over-the-counter' nature of contractual documentation for many renewable energy projects. This is a legacy of an energy sector oriented towards fossil fuels, where power projects used to be large in size and technically complex. However, many renewable energy projects, especially solar and biomass, tend to be much smaller and simpler than conventional energy projects, so there is an opportunity to standardize project documentation.

Standardized contracts can reduce due diligence costs for investors and help to drive market growth. The process of standardizing contracts has long been used in structured finance – from futures contracts to mortgage loans. If applied to renewable energy markets like solar, standardised contracts could result in significantly greater investment from institutional and other investors as they allow an easier and faster project review process.

initiatives to standardise project documents

The National Renewable Energy Laboratory (NREL) in the US has developed a standardised residential lease and commercial PPA contracts via the Solar Access to Public Capital working group. This represents 440 organisations, including residential and commercial solar developers, law firms, investment banks and capital managers, rating agencies and engineers (NREL, 2015). The standardised documents have been made publicly available and act as the necessary first step to enable solar project securitisation. It has already met with some success, having been used by SolarCity, a national solar developer that successfully issued asset-backed securities on bundled cash payments of these PPAs. National governments could also take steps to streamline investment through standardised contracts with a focus on PPAs. This is the approach South Africa took with the Renewable Energy Independent Power Producer Procurement Programme. The well-designed and transparent procurement process facilitated over 3,900 MW of projects during its first two rounds.

Aggregation

Renewable energy projects tend to vary in terms of size. They range from very small, micro-scale (<100 kW) to large, utility-scale projects. Since transaction and due-diligence costs tend to be similar for all project sizes, smaller-scale projects are at a relative disadvantage in attracting large-scale investors. Banks are looking for larger deals partly to cover the due diligence and transaction costs involved and partly to have a meaningful impact on their portfolios. Institutional investors such as pension funds and insurance companies require 'benchmark-size' deals greater than USD 300 million. This is because few institutional investors have the internal capacity or willingness to evaluate and underwrite individual

renewable energy projects. Domestic institutional investors in developing countries may lack the capacity or mandate to form an in-house investment team to perform the due diligence, structuring and negotiations required for direct investment.

Aggregating smaller-scale renewable energy assets can help scale up investment volume and reduce due diligence costs per project for institutional investors. Asset aggregation in distinct structures permits the creation of various individual tranches to appeal to a variety of investor appetites, broadening the potential pool of capital providers.

INITIATIVE FOR AGGREGATING SMALL-SCALE RENEWABLE INVESTMENTS

UNDP, the GEF and the Climate Bonds Initiative are exploring the possibility of implementing the Climate Aggregation Platform for Developing Countries. The initiative aims to scale up business and financial models in order to aggregate small-scale, low-carbon energy investments. Building a robust pipeline of standardised renewable energy assets in developing countries could increase access to low-cost sources of financing and tap into new investor bases (e.g. institutional investors). The Climate Aggregation

Platform is structured around three core activities in particular:

1. Management of a global working group that promotes engagement and co-ordination among finance and industry stakeholders.
2. Development of standardised toolkits (e.g. template contracts, performance metrics, transaction structures) that promote the standardisation of terms necessary to aggregate projects;
3. Demonstration of projects and provision of technical assistance for developing countries.

Implementation of these activities is expected to showcase pilot projects and best practices. This will foster development of the policy and market architecture necessary to build a robust pipeline of small-scale renewable energy projects and ultimately achieve scale.

Securitisation

Renewable energy asset securitisation allows project sponsors to issue individual securities featuring a variety of ratings, risks and returns to correspond to different investor preferences. As securitisation enables banks or other capital providers to access a secondary market, capital can be reinvested, replenishing the amount available for renewable energy projects. Creating a model for securitising small-scale solar assets could thus significantly reduce the cost of financing and free up funding to accelerate this process. The securitisation process starts by grouping assets with similar characteristics and then selling them to a separate entity,

usually an SPV, to protect the assets from any outside claims by creditors. The capital structure is then constructed to apply various claims on both the cash flows and market value of the project in the form of debt, equity and hybrid structures. Securitisation takes this process a step further, issuing distinct and marketable securities (tranches) out of the trust, in order to create securities such as asset-backed securities. These can be sold in the financial markets.

One way of creating highly rated securities is prioritising the payback of certain tranches from low to high. Principal and interest payments first go to the highest rated security, usually called the senior tranche. The remaining funds are passed down to the next lower tranche. The junior tranche is last in line and thus has the first loss position.

OFF-GRID SOLAR SECURITISATION IN AFRICA

For off-grid solar businesses to scale up and expand, they have to go beyond relying on impact investors and DFIs and aim to secure large sums of commercial debt capital securitising their receivables. Some companies are trying to access mainstream finance via securitisation to mobilise largescale private investors. Dutch impact investor Oikocredit International, New York-based merchant bank Persistent Energy Capital and a London-based developer are trying to replicate the US model of securitising residential solar panels in Kenya and Rwanda. They have plans to expand to Pakistan and Nigeria. They signed the first off-grid solar contract securitization deal into notes in Africa early in 2016. The team is targeting institutional investors with an aim to raise USD 16 million in 2016 and USD 2 billion over five years. Securitising off-grid solar receivables in the pay-as-you-go model demonstrates a promising way of building a track record and institutional know-how to execute such a deal.

SOLARCITY SECURITIZATION

SolarCity was the first company to securitise a portfolio of solar leases in 2013 and since then it has raised USD 450 million in four rounds of issuing asset-backed securities. This successful model was first considered too complex and advanced for developing countries to implement but some investors viewed it as a new opportunity. As experience builds up, similar efforts to turn the off-grid solar industry into an asset class are likely to spread to other parts of the developing world.

6.1.3. Increasing awareness

It is advantageous to emphasise the potential of the renewable energy sector in terms of employment, regional development, national security, poverty alleviation and energy access. In some situations, renewable energy is already the most cost-effective option to achieve certain policy goals. For example, developing countries often have a substantial number of people without access to national electricity grids, making expanded energy access an

important policy priority. Small-scale renewable energy installations for remote off-grid communities can be the cheapest way to achieve this goal in some regions.

The Brazilian government's commitment to providing energy for 100% of the population ("Energy for All") has a strong renewable energy component for this reason. Renewable energy is the best and the cheapest way to reach the people in remote areas such as the Amazon rainforests in Brazil.

It is extremely important among key stakeholders, including local bankers and fund managers, transmission and distribution utilities and system operators, development and electrification agencies and representatives from the industry to gain information and build capacity for renewable energy to develop in their respective organizations. This may consist of initiatives to support voluntary agreements, organization of dissemination workshops for best practices, information campaigns and the support of energy audits and feasibility studies. It is only through increased awareness in society through the various measures taken at all levels that the public at large will know the benefits of renewable energy.

6.2. Mobilizing International Initiatives

Clean Development Mechanism (CDM)

Description:

The Clean Development Mechanism (CDM) is a mechanism which is intended to contribute to the ultimate objective of the United Nations Framework Convention on Climate Change (UNFCCC), which is to prevent dangerous climate change. The basic principle of the CDM is simple; it allows developed countries to invest in low cost abatement opportunities in developing countries and receive credit for the resulting emissions reductions (CER). Developed countries can then apply this credit against their carbon emission reduction targets, reducing the cutbacks that would have to be made within their borders. As a result, projects in developing countries will get a new source of financing for sustainable development in the introduction of clean and renewable technologies by selling their emission reduction on the market.

Mobilization:

A country must propose a CDM project activity through a dedicated interface on the UNFCC CDM website after following the set regulations. This activity will go through stringent validation checks to decide the amount of carbon emissions it has been able to achieve after which it will be issued CER certificates accordingly. These CERs can then be traded like a commodity on the carbon market.

Challenges:

The effectiveness of Clean Development Mechanism (CDM) for facilitating investments in renewable energy is limited because CDM-approval process imposes high costs of transaction. Thus, financing through the CDM will remain a fringe activity until complexity is reduced and policy risk is eliminated. In general, CER-revenue represents either "icing on the cake" for project developers and/or a means for the state to reduce the cost of national subsidies to renewable energy projects. CDM promotes investments in renewable energy only when it is part of a larger financial support package.

Brazil is a successful promoter of Clean Development Mechanism (CDM) projects. Brazil's CDM projects account for 40% of all CDM projects in South America and for 44% of contracted Certified Emission Reduction (CER) credits up to 2012.

In Mexico, a 250.5 MW and USD 600 million EURUS wind park was set up in the midst of the financial crisis. EURUS is permitted to generate 876 GWh annually and as a Clean Development Mechanism (CDM) project, EURUS benefits from the sale of Certified Emission Reduction (CER) credits for offsetting a total of 599,571 tonnes of CO_2 annually.

Nationally Appropriate Mitigation Activities (NAMAs)

Description:

NAMAs refer to any action that reduces emissions in developing countries and is prepared under the umbrella of a national governmental initiative. They can be policies directed at transformational change within an economic sector, or actions across sectors for a broader national focus. NAMAs are supported and enabled by technology, financing, and capacity-building and are aimed at achieving a reduction in emissions relative to 'business as usual' emissions in 2020. NAMAs are defined in two contexts:

NAMAs at the National Level:

At the National Level, as a formal submission by Parties declaring intent to mitigate greenhouse gas emissions in a manner commensurate with their capacity and in line with their national development goals. An open invitation for countries to communicate NAMAs aimed at achieving deviation from business as usual emissions. So far, fifty-seven countries as well as the African Group have done so.

Individual NAMAs that contribute towards meeting the objectives of NAMAs at the National Level:

At the **Individual Action Level,** as detailed actions or groups of actions designed to help a country meet their mitigation objectives within the context of national development goals.

Mobilization:

These NAMAs are to be registered by interested parties on the dedicated UNFCC NAMA portal and exist in one of the stages below:

- **NAMAS seeking support**: This is the list of all NAMAs that have been submitted for consideration by various contenders.
- **NAMAS for recognition**: These are the NAMAs that have been shortlisted by UNFCC to be further shortlisted to move to the implementation stage.
- **Support provided/received**: These NAMAs have been selected for providing financial aid to execute them.
- **Information on support available**: This is a list of all countries or organizations that have made contributions to the NAMA fund. It is from this fund that the execution of selected NAMAs takes place.

Appropriate Mitigation Actions in Energy Generation and End Use Sectors in Sri Lanka

This NAMA project will seek to overcome the regulatory, institutional, technical, financial and social barriers for the scaling up of renewable energy and EE NAMA through the dissemination of 1,000 bio-digesters, 1,300 high efficiency motors in tea factories, and 205 solar PV net metering systems with battery storage.

New Market Mechanisms (NMMs)

Description:

One key goal of NMMs is to scale up mitigation actions in developing (and among them, emerging) economies. The idea is to move beyond project and programme level activities towards targeting broad sectors of the economy. A sectoral scope would provide more flexibility to parties to choose the mitigation policies and measures needed to achieve their sectoral targets and participate in the NMM. The negotiations on NMMs however, continue to lack consensus across parties and there are broadly two schools of thought. For instance, the EU in its submission to the UNFCCC in 2014 prefers that NMMs should encompass broad sectors of the economy and be implemented through crediting and trading.

Challenges:

The status quo on NMMs is that challenges and difficulties in establishing the NMM remain and need to be solved. This includes data reliability, policy interaction, legal barriers, and how to deal with state-owned companies. Further, a clear and integrated law framework at the national level, and an effective mechanism to coordinate the NMM with the existing and upcoming policies would be required. Clarity on each of the items are required before the NMM can be implemented.

Nationally Determined Contribution (NDC)

Description:

2015 was a historic year in which 196 Parties came together under the Paris Agreement to transform their development trajectories so that they set the world on a course towards sustainable development, aiming at limiting warming to 1.5 to 2 degrees C above pre-industrial levels. Nationally determined contributions (NDCs) are at the heart of the Paris Agreement and the achievement of these long-term goals. NDCs embody efforts by each country to reduce national emissions and adapt to the impacts of climate change. The Paris Agreement requested each country to outline and communicate their post-2020 climate actions, known as their NDCs. Each of the SAARC nations have submitted their NDCs and integrated the targets therein in their renewable energy policies. The onus now lies on each of the SAARC nations to follow through with these targets.

Table 37: SAARC NDC Figures

Country	Target	Investment Requirement
Afghanistan	Cut emissions by 13.6% from business-as-usual levels by 2030	USD 17.4 billion
Bangladesh	Reduce GHG emissions by 5% by 2030 from business-as-usual levels in power, transport and industry sectors	USD 40 billion
Bhutan	Plans to remain carbon neutral	-
India	Cut GHG emissions by 33%-35% of the 2005 levels by 2030	USD 1040 billion
Maldives	Cut emissions by 10% from business-as-usual levels by 2030	-
Nepal	Reduce fossil fuel dependency by 50% by 2050	-
Pakistan	Intends to reduce GHG emissions by 20% from projected 2030 levels	USD 40 billion
Sri Lanka	Cut GHG emissions by 7% from business-as-usual levels by 2030	-

Approach the SAARC nations need to follow regarding CDM, NAMAs and NDCs:

Each of the above mechanisms are overlooked by world agencies such as the United Nations. The availability of resources is limited and the number of countries requiring help is relatively large in number. As a result, a proactive and first come first serve approach is needed by the SAARC member states in procuring the aid available. In certain situations, the SAARC region needs to put a united front in request for aid so that the region as a whole gain's prominence in its funding requirement. This can be achieved by ensuring appropriate representation of SAARC at the world agencies. Also, it is the prerogative of the nations to ensure that this funding is used in the most productive manner by the countries such as helping mitigate the

risks and barriers affecting private finance aimed at scaling up renewable energy investment instead of financing individual projects.

6.3. Encourage Cross-Border programmes, collaborations and cooperation for development of renewable energy sector

There is huge potential for regional cooperation especially in the renewable energy sector which is still in the developing stage in most SAARC countries. Broadly, three areas of cooperation have been identified:

- **Cooperation among government entities:** Government ministries, public officials and administrators can cooperate with each other to provide guidance on policy formation, targeted interventions, trainings and on the ground execution of renewable energy projects. They can contribute in capacity building and technical assistance in member nations. An excellent example of an amalgamation of all the above is the power purchase agreements between India and countries such as Bhutan and Nepal in which India has helped set up hydroelectric power stations in these countries and imports power from them for domestic consumption.

An example of an effective training programme was when the National Institute of Solar Energy (NISE) in India successfully completed an International Training programme for SAARC member countries, which was held from 12th September to 29th September 2017 with financial support from Ministry of New and Renewable Energy. The programme was organised to enhance the capacity of Solar Technologies among SAARC members. During the programme, internal and external speakers delivered lectures in different fields of solar energy and NISE took the International participants to Jaipur city for showing them solar water pump and other solar equipment.

- **Cooperation among financial institutions:** A regional guarantee fund or facility may be established to meet specific regional development needs and position renewable energy strategically in the regional agenda. Financial Institutions in one SAARC country can bear the counterparty risk for an investor form another country. Independent finance institutions such as India's IREDA can cooperate with each other to discuss ways of increasing the pace of fund mobilization in renewable energy. Other financial policies that have done well in one country such as the solar home system schemes in Bangladesh can be replicated in other countries. Local finance institutions can conduct workshops on important areas such as understanding how to assess renewable energy projects. It is imperative for the national governments and central institutions like SAARC to take the lead in facilitating financial cooperation as trust is an important factor in such cases.

The European Fund for Strategic Investments is providing EUR 21 billion under the EU Juncker plan for a guarantee fund expected to mobilise EUR 315 billion. By 2017, this will go into infrastructure projects in the EU, including renewable energy projects (European Commission, 2016b). The EFSI plans to use the guarantee fund to support renewable energy projects bearing a higher risk profile than projects supported by the normal operations of the EIB. The initiative garnered strong support from many European national governments, which have pledged financial contributions. This regional approach could be applied to other regions or countries via partnerships between governments and public finance institutions.

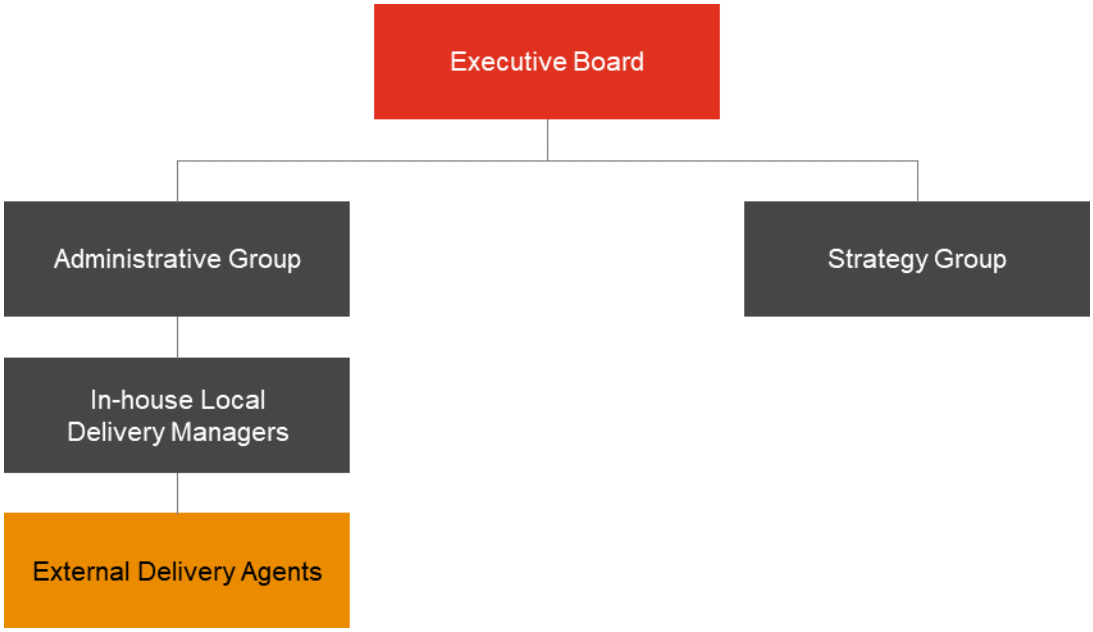
- **Cooperation among a range of other stakeholders:** It is equally important to engage a range of stakeholders from across the public, private, academic and non-profit sectors to increasing learning, knowledge transfer and absorptive capacity among local actors. This will help create awareness and share knowledge and skills that are highly developed in one country among its neighbors.

6.4. Importance of cooperation among related entities of SAARC Member States

6.4.1. Institutional Framework with roles and responsibilities

A central, independent, mission-driven organisation at the SAARC level needs to be established. The mission of this organization will be a pioneering, participants friendly and competitive institution for financing and promoting self-sustaining investment in energy generation from renewable sources in the SAARC member states. Along with this central mission it will also provide support to various projects in the form of technical assistance, getting government clearances, providing crucial project execution support and so on. There would be appropriate ownership, with establishment of shared governance and control of project prioritisation. A partnership element between this organisation and international donors could include agreed goals and success criteria.

Figure 14: Organisation Structure



The Executive Board could consist of equal representation from the organisation, national governments of member states and independent members (*e.g*. local business, academic communities). It would be responsible for defining the strategy, plans and budgets for the delivery of activities, developing an organisation capable of delivering the plans, managing the delivery of the plans and monitoring and reporting on progress.

The Administrative Group would facilitate the delivery of the various programmes and would act as a local centre of excellence for renewable energy finance, engaging with public and private stakeholders.

The Strategy Group would be responsible for analysing and explaining the issues and opportunities around renewable energy finance locally and for providing input into the development of the organisation strategy and delivery plans.

In-house Local Delivery Managers would be responsible for the delivery of the activities, supported where necessary by external delivery agents.

Method of Operation:

The organisation would draw up proposals on an annual basis for approval. Objectives and targets could include a leverage target (*i.e.* raising additional private and/ or public sector funds), project delivery targets (*i.e.* the number of projects started/completed across the various areas of activities) and outcome targets, which could include Intellectual Property generation, the numbers of companies attracting further funding, and installed renewable energy capacity.

- **Funding:**

Funding must be on a scale and commitment time horizon enough to allow planning and implementation of complex projects, including sufficient public funding to undertake pre-commercial activities. An effective collaborative relationship with the governments and the private sector would be needed to leverage additional funding, without compromising the ability of the organisation to provide an independent viewpoint on the policies needed to contribute to agreed goals. The organisation could require funding given the long lead times involved in renewable energy development and deployment projects, a five-year funding budget would be the minimum necessary to establish local networks and achieve measurable progress. Future funding for subsequent time periods should be considered in light of the success of the first phase. The organisation would seek additional funding from other sources and could reasonably be expected to leverage 5-10 times as much in private sector investment overall. Funding from additional sources and leveraging of private sector funding would be expected to increase over time.

- **Project Selection:**

The size of the organisation needs to be sufficient to support a range of renewable energy projects and early-stage companies. However, these must be set in the context of the ability for the local market to supply the required number of projects (*e.g.* larger, more industrialised countries are likely to have many projects to fund). However, member countries where access to energy is of primary concern may wish to concentrate their efforts on funding deployment of one or two key clean energy technologies. The organisation would allocate funds based on prioritization of the range of projects available to them. The organisation could enable up to 50 projects per year to be supported, many of which could lead to self-sustaining low-carbon technologies and businesses, given appropriate policy environments, with considerable carbon and economic benefits.

- **International Cooperation:**

National renewable energy finance centres from member countries as well as non-member countries and renewable energy finance organizations at the world stage could form part of the organization's network to maintain a global perspective, agree on overall plans, monitor progress and ensure knowledge transfer at the world level.

6.5. Evolution of One Mode of Financing to the Other

As elaborated in section 2.3.1, there are broadly three modes of financing that SAARC Member States could be categorized in. In order to move to the next phase of financing they need to cover financial instruments and investment strategies that are applicable to their phase. Further, they shall be required to branch out on those applicable to the next phase in a set

period (3 to 5 years). The following table summarizes the phase wise categorization of the various financing strategies that have been elaborated in the earlier sections of this report:

Description	Public Funding Mode	Public Private Partnership (PPP) Funding Mode	Private Funding Mode
Countries	• Afghanistan, Maldives, Nepal, Pakistan	• Bangladesh, Bhutan, Sri Lanka	• India (In between PPP and Private funding mode)
Financial Instruments	• Budgetary Allocations • Borrowings/ Grants from international agencies like World Bank • Political Risk guarantee	• Venture capital funds • Infrastructure Funds • Debt from development finance institutions/climate finance institutions • Government guarantee • Carbon Financing • Infrastructure Investment Trusts • Small scale project financing • Loan syndication	• Private Equity Funds • Pension Funds • Debt from local finance institutions/banks • Green Bonds • Asset backed securities • Aggregation, securitization
Investment Strategy	• Choice of policy instruments, policy design, and complexity of the policy package tailored to the actual conditions of the system in the type of market, supply or demand volume, and nature and level of risks, as well as institutional and administrative capacity. • Increasing awareness among the citizens	• Targeted interventions by the government such as priority sector lending, clean energy funds • Smart subsidies, tax exemptions, renewable obligations • Price based policies such as feed in tariff, net metering • Management of renewable energy finance programs by independent organizations • Incentives to reduce costs of renewable energy technologies • Mobilizing CDMs, NDCs	• Letting the market forces of demand and supply take over with minimum requirement of government intervention

7. Recommendations

The report concludes with the proposed recommendation for mobilization of regional and international funds in SAARC member states.

a. SAARC nations should design effective Public Private Partnership (PPP) mechanisms

Development of GRID infrastructure and large-scale renewable energy projects are very capital intensive. A PPP model is one of the effective ways of attracting investment from private investors. The model can be devised at a country level and can be changed based on risk associated with the different type of projects. PPP mechanisms may enable governments to engage private investment in direct public spending more efficiently, precisely, and without the adverse effects of alternative government programmes such as subsidies or tax waivers. PPP offers multiple advantages, which includes:

- It reduces the project life-cycle cost and administrative cost specially in case of third-party financing
- It helps allocate risk in a better way between public and private sectors
- It provides better incentives and greater commercial value for public sector assets.
- It provides faster implementation as private sector may be better equipped to deliver the services.

For example, IFC helped the government of Madhya Pradesh state, India, structure and tender a PPP for the 750 MW REWA solar park, which is one of the world's largest single–site solar plants. IFC also created an innovative power distribution model enabling the Delhi metro to take energy straight from the park to power its trains.

b. Use of Risk Mitigation Instruments

Both domestic and international investors have underutilized the financial instruments. These financial instruments include Guarantees and insurances. One of the prime reasons is that the investors are not aware of the available financial instruments. Second reason being availability of financial instruments in each country. These instruments will help mitigate the risk like political risk, policy and regulatory risk, power-off taker risk, technology risk, etc. that are perceived by the investors. The government should proactively build instruments that can be easily availed by the investors. The government should actively support private institution, which design and provide guarantees and insurances for renewable energy sector. To build an effective instrument, the government and local entity should collaborate with foreign entities, which are active in mature renewable energy market like USA, Germany, China, etc. These risk mitigation instruments should be available to the investors during the initial phase of project

development. The national policy makers, developers, investors and other stakeholders should also be briefed on the importance of financial instruments.

The institution procedures should be streamlined to make sure the financial instruments are available to the investors. A standard risk assessment template should be prepared so the potential risks pertaining to a project can be identified. In addition, the template can be used across all the renewable energy projects.

c. Encourage local financial institutions to invest in renewable energy projects

Public finance institutions can play an important role in improving project readiness and attractiveness. As the SAARC member states have plans to scale up renewable energy installations at a faster pace, the increase in involvement of local banks will help the states to achieve the desired RE targets. Local financial institutes can provide a bridge finance for projects in initial stages. The government should take necessary actions to increase the capacity of domestic banks as it will improve access to capital at the local level. Lack of awareness and high project risks are the major reason because of which the local banks and institutions are inactive in the RE sector. The local institute can actively promote the use of innovative financial instruments like Green bonds, Infrastructure Investment Trusts, Carbon financing and small-scale project financing.

The government should develop plans, which will mitigate risks that are associated with RE projects from the lenders (domestic and foreign investor) point of view.

In India, local banks have played a major role in providing long-term loans to project promoters. They have helped in implementation of large-scale solar projects, which required large capital investments. The government of India (GoI) has set up solar parks across various states. The risk for the investor was minimized as the GoI had acquired the land and built the grid infrastructure for power off take from the solar plants.

d. Create Renewable Energy specific policy and incentives

The investors should be provided with incentives that reflect different stages of development from R&D to commercial use of renewable energy technology. Address specific market barriers, reward innovation and be cost effective. The policymakers should encourage fixed price schemes and provide market-based instruments such as carbon trading schemes. Policies at regional level should encourage energy trade between SAARC member states. It will ensure long-term sustainability in the region and development of economy in line with the vision of SAARC energy charter treaty. Each country should develop specific policies and incentives like tax exemption, minimum or no import duty on renewable energy related imported equipment, accelerated depreciation, etc.

The SAARC member states should focus on setting up renewable energy specific targets at both country and regional level. The goals should be set on yearly, 5 years, 10 years basis as it will help the country to effectively track the development in this sector.

e. Facilitating decentralized renewable energy solution

Access to modern energy is an essential driver for socio-economic development in the region where millions of people still lack access to electricity and rely on traditional biomass for heating and cooking. To overcome the challenge, SAARC member states should consider both on-grid and off-grid solutions to reach universal access in a timely manner. These should identify areas to be served through each solution and implications for when the national grid arrives. Before executing such plans, it is necessary to understand the existing practices and projects that should be considered along with the potential to scale up. Solar energy is one of the effective solutions to the off-grid problem especially in countries.

For example, in Myanmar, thousands of small-hydro and biomass gasifiers have been deployed to provide a wide range of consumptive and productive energy services in rural areas.

f. Institutional Framework with roles and responsibilities at the SAARC level

A central, independent, mission-driven organization at the SAARC level should be set up. There would be appropriate ownership, establishment of shared governance and control of project prioritization. A partnership element between the member states and international donors could include agreed goals and success criteria.

g. Cross-Border programmes, collaborations and cooperation for development of renewable energy sector

There is huge potential for regional cooperation especially in this sector which is still in the developing stage in most SAARC countries. Broadly the three main areas of cooperation identified are:

- Cooperation among government entities for policy formation, targeted interventions and on the ground execution of renewable energy projects
- Cooperation among financial institutions such as local financial institutions and formation of a regional guarantee fund
- Cooperation among a range of other stakeholders from across the public, private, academic and non-profit sectors.

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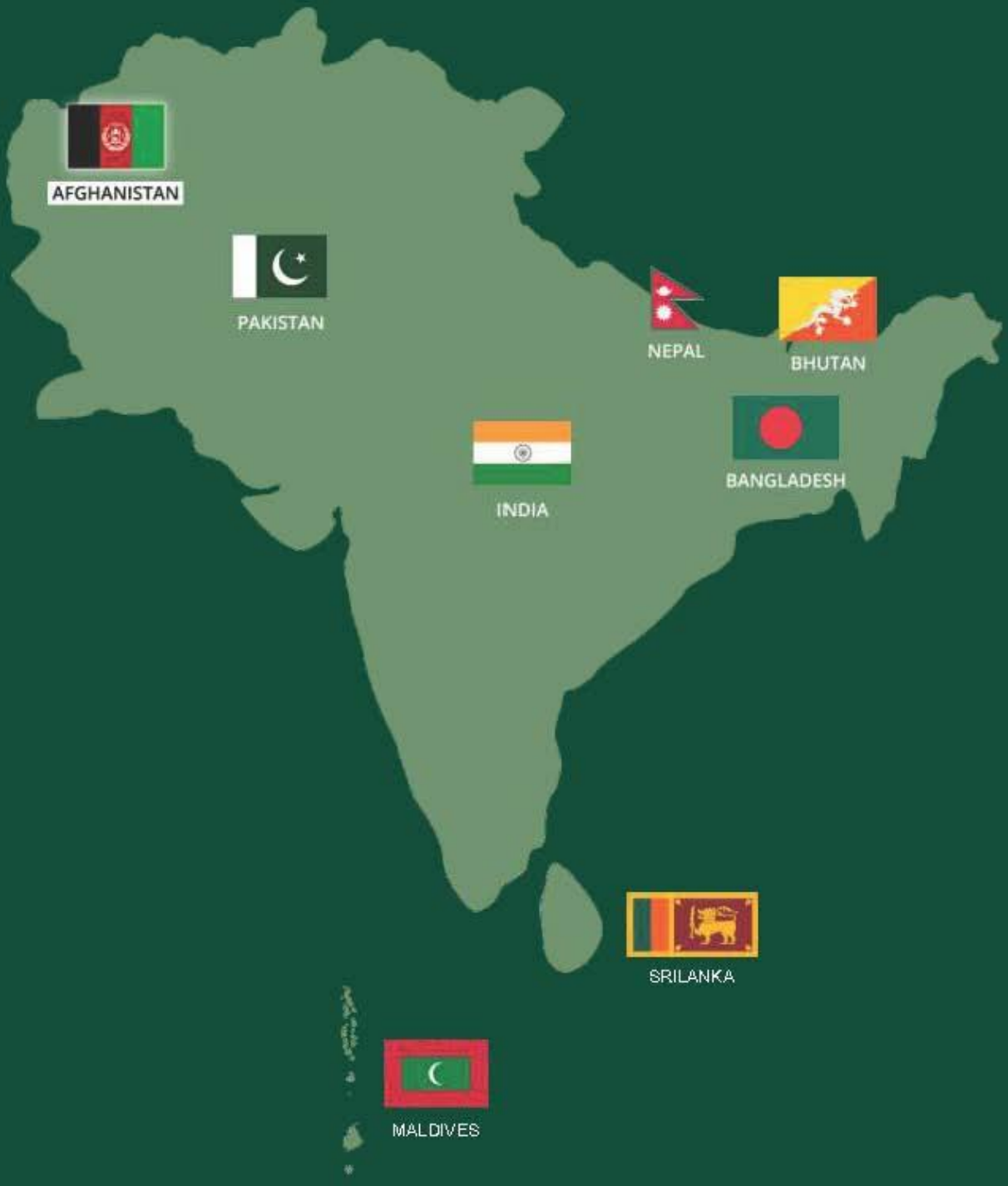

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